CALIFORNIA
# OIL WORLD

PUBLISHED TWICE A MONTH
FOR TIMELY, COMPLETE
CALIFORNIA OIL NEWS COVERAGE

• SECOND ISSUE
OCTOBER, 1945
VOL. 38 • NO. 20
WHOLE NO. 1690

PETROLEUM PUBLISHERS, INC.
MEMBER AUDIT BUREAU OF CIRCULATIONS
W. C. MONROE—President and Editor •
117 WEST 9TH STREET
LOS ANGELES 15, CALIFORNIA
KINZIE MILLER—Vice President

New York Office: 17 E. 48th St., New York 17, N. Y.— Telephone: WIckersham 2-1127 — John H. Kunkel, Manager

California Oil World is published twice a month at 117 West 9th St., Los Angeles 15, California. Entered as Second-Class Matter, April 29th, 1944, at the post office at Los Angeles, California, under the Act of March 3, 1879. Subscription price $1 per year in U. S. and possessions, $2 in foreign countries including Canada. Member of the Audit Bureau of Circulations.

October 30th, 1945
Telephone Number TUcker 2571

Carrington King

Exploding on California like an atom bomb, the Justice Department's suit against California's tideland oil properties completely disrupted plans to push legislation quitclaiming whatever rights the U. S. might have to tidelands properties throughout the country.

(Ed. note: Filing of the suit in the United States Supreme Court occurred after Carrington King's earlier story on this subject had been received.)

Announcement by U. S. Attorney General Tom C. Clark that his Department had acceded to the demands of Secretary of the Interior Ickes came as such a surprise that members of Congress were unwilling to make any prediction as to its effect on hearings scheduled by the Senate Judiciary Committee for Dec. 4 and 5. Fears were expressed, however, that—with California the sole target of the Government's attack—the interest of the other States in enacting the tidelands bill might lag.

The Justice Department action represents a radical change of policy on the part of the Government. In its statement, the Department defines the tidelands as the area lying between the high and low water marks and lays claim only to the lands under the "marginal sea,"—in other words, lands extending from the low water mark **on the open sea** out to the three-mile limit. Lands underlying bays, harbors, rivers and other inland waters are thereby exempted from the proposed U. S. seizure.

In the event of a Supreme Court decision establishing the Government's claims, many oil companies operating in the Elwood Field, Huntington Beach, Seal Beach and at other locations on the ocean front will be put out of business. Wells owned by the City of Long Beach and operating in Long Beach harbor, however, presumably will be allowed to continue production.

Effect of a decision in favor of the U. S. upon the California oil industry cannot be adequately foretold until some inkling is given as to what disposal will be made of the oil under Government ownership. Will the U. S. take over present State leases without change? Will the oil be retained as a national petroleum reserve? Will present lessees be ousted, to be replaced by individuals who, for the past 10 years, have been filing lease applications with the Department of the Interior?

What, if any, compensation will be offered individuals and corporations who may be dispossessed?

These are only a few of the alarming questions raised by the suit against the State of California. The case—which may not come up until next spring—will be argued as a "pure question of law", this writer was told, leaving no opportunity to the State to present facts not bearing on the legal issues. Prompt action is expected on the Government's motion for leave to file the complaint, however.

The Court may accept or deny the Justice Department's filing. If it issues a rule to show cause, California will have the right to present its arguments as to why the Government should be denied the privilege of carrying its case to the Court.

If Congress refuses to go through with the pending tidelands legislation California's only hope lies in a decision against the Government by the Highest Tribunal.

In its statement, the Justice Department contends that the rights of the United States in lands under the marginal sea have never been adjudicated by the Supreme Court.

"The issue is entirely novel," the statement declared, "for this case is sharply to be distinguished from those decisions which are thought to hold that the State has proprietary interests in bays, harbors, rivers and other inland waters as well as the so-called tidelands."

What are California's plans for some form of oil conservation?

Although Secretary of the Interior Ickes tried hard to revive the old issue of a State proration law at a recent press conference, very little is heard in Washington about the California oil industry's 1945-1946 attitude on this matter.

Reports from the West Coast indicate the same group of independ-

*(Continued on Page 50)*

# 20th Annual Fall Meeting, C. N. G. A.

More than six hundred members and guests of California Natural Gasoline Association attended the 20th Annual Fall Meeting of that group at the Biltmore Hotel, Friday, October 12, 1945, in connection with which a morning and afternoon program of papers by recognized authorities in their respective fields was presented. This event has become traditional among men in the natural gas and natural gasoline divisions of the oil industry in California, and is becoming of growing interest to those in the refining, production and other branches of the business.

Mr. M. L. Arnold, president of the Association, opened the afternoon session with the following remarks:

## Remarks by M. L. Arnold At CNGA Fall Meeting

At this point our meeting program is somewhat in error. Instead of "A Message from the President," it should state, "The President Cries for Help." He very greatly needs your assistance in determining in what manner C.N.G.A. may increase its service to its members and to the industry of which they are a part.

C.N.G.A. is primarily a service organization. It continues to exist only if it continues to serve. It grows only by increasing the number and value of its services.

The services now being performed for the individual members and for industry are of great value. For industry, these include the various standardization programs and the collection and distribution of statistics concerning the production and use of natural gas, natural gasoline and L.P.G. For the individual, they include opportunities for development through service on various C.N.G.A. committees, the educational opportunities afforded by attendance at C.N.G.A. meetings, and further opportunities for development through active participation in these meetings.

These services are of value also to the engineering and equipment companies. The standardization program has provided them with reliable tests and measurements on which to evaluate the performance of the plants and equipment which they supply. The meetings provide an opportunity for their representatives to become more familiar with the problems of industry and to meet the engineers and operating men of the petroleum industry.

**W. L. Rifenberick, Industrial Engineers, Inc., Fall Meeting Chairman.**

As previously stated, if C.N.G.A. is to grow, the value and number of its services must be continually increased. It seems fundamental that any service added should either fill a need of industry, or of a large proportion of the membership. Furthermore, the service should not duplicate one now being adequately performed by another organization. Obviously, this leaves a very broad field open to us. In considering it, I find myself in the position of a certain football player, who, several years ago found himself unexpectedly in possession of the ball. He realized that it was up to him to carry it, but was confused as to the direction to take. Likewise, I am not certain of the best direction to take. I have some ideas which I will mention but, inasmuch as I have no desire to go down in C.N.G.A. history as "Wrong-way Arnold," I am requesting you to give me your opinions as to the goal towards which our activities should be directed.

Concerning the additional services which C.N.G.A. can render for industry, I believe that one of the most important would be the promotion of a greater spirit of cooperation between the producing, natural gas and gasoline, and the refining divisions of the petroleum industry. This can best be accomplished by bringing about a better general understanding of the problems of each division and particularly of problems common to two or more divisions. Two problems of this latter type will be mentioned.

In planning for the production of fields by pressure maintenance or by cycling, close cooperation is required between the engineers of the producing and the Natural Gasoline Divisions to insure the installation at a minimum cost of ample facilities for the production of the field. This requires an understanding by the Gas Department engineers of the principles of reservoir control and operation. It requires an understanding by the Production Engineers of the limitations inherent in pipeline systems and absorption and compression plants. The inclusion in our programs of papers such as those presented this morning should do much to advance this understanding.

A problem common to both natural gasoline and refinery men concerns the most efficient utilization of that portion of our petroleum resources represented by propane and butane. One of the objectives of the meeting this afternoon is to further our mutual understanding of this problem. By including in C.N.G.A. Program Committees, men from the producing and refining divisions, other problems of mutual interest will be disclosed. The discussion of these problems at C.N.G.A. meetings would be instrumental in bringing about that greater spirit of cooperation which is our objective.

A second service which C.N.G.A. can render for the natural gas and gasoline industry is to actively work to enhance its prestige. This could be accomplished by conducting an educational program to fa-

**GROUP OF SPEAKERS, 20TH ANNUAL FALL MEETING, CALIFORNIA NATURAL GASOLINE ASSOCIATION. Left to right: F. D. Parker, Consulting Engineer; M. M. Perkins, M. W. Kellogg Co.; Fred Hartley, Union Oil Co. of Calif.; E. W. McAllister, Western Gulf Oil Co.; H. A. Gehres, The Cooper Bessemer Co.**

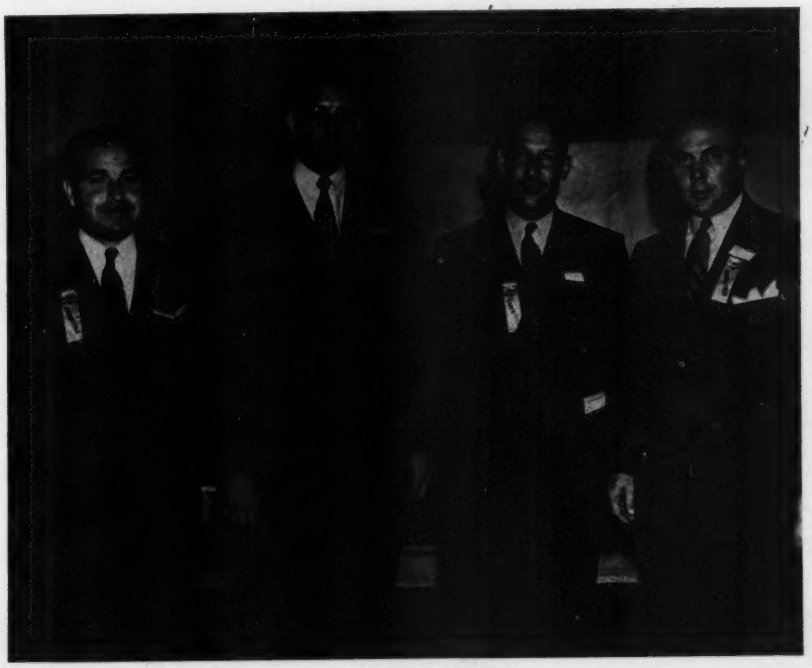
miliarize other divisions of the petroleum industry and the general public with the value of the services performed by the natural gasoline industry. This should include the enumeration and a statement of the value of the facilities installed in each field by the natural gasoline industry to serve the producer; a statement of the economic loss which would be experienced if the gas produced were wasted; and a statement of the extent and value of the pipe line systems installed for the purpose of supplying the producer with residue dry gas for fuel. Such information should be released periodically to the oil editors of the newspapers and to the trade journals.

The public should be informed of the role the natural gasoline industry plays in collecting and processing the natural gas used for domestic and industrial fuel. The public should also be made familiar with the products of the natural gasoline industry and their uses. An expanded publicity committee working through the newspapers and magazines should be the medium for accomplishing this.

There are several new services which C.N.G.A. could render for its individual members. A few will be mentioned which would be of value to those who are engaged in technical work. The average engineer finds it impossible to keep up with advances in all the branches of science and engineering in which he must work. However, through cooperative endeavor, this task could be brought within the realm of possibilities. For example, we are kept up-to-date on physical constants through the work of the C.N.G.A. Physical Constants Committee. We are kept up-to-date on metering practices through the activities of the C.N.G.A. Gas Measurement Committee. Similarly, we could be kept up-to-date in other fields, such as the compression and pipeline flow of gases, the computation of vapor-liquid equilibria, and the computation of the number of plates required for strippers, fractionators, and absorbers.

Some years ago, a start was made along this line with the formation of a compressor committee. For the operating pressures then in effect, this committee made excellent recommendations for the computation of the capacity of compressor cylinders and the horsepower required for the compression of gas. Since that time, operating pres-

*(Continued on Page 47)*



**GROUP AT 20TH ANNUAL FALL MEETING, CALIFORNIA NATURAL GASOLINE ASSOCIATION, Left to right: M. W. Kibre, General Petroleum Corp. of Calif., Vice-president; M. L. Arnold, Richfield Oil Corporation, President; George F. Howells, Tide Water Associated Oil Co., Secretary Taft Chapter, CNGA; George L. Tyler, Secretary, CNGA.**

**Here is the K-2, H. C. Smith Rock Bit—a development of the latest type, long-tooth bit for faster drilling of straight hole through sticky shales and sandy shales. The cutting action of the K-2 plus the improved bearing design maintains the H. C. Smith tradition of building better Rock Bits for fast, straight, full-gauge holes through every type of formation.**

**Write for bulletin.**

# H C Smith Oil Tool Co.

GENERAL OFFICES AND PLANT - P. O. BOX 431, COMPTON, CALIF.

# An Engineer's Viewpoint on Design of Compressor Cylinders for High Pressure Gas Compression

By H. A. GEHRES, Vice President
The Cooper Bessemer Company

In recent years a great amount of development has taken place in the construction and use of high pressure compressor cylinders in the range of 300 to 6,000 lbs. per square inch pressures for various purposes. The chemical industry has been responsible for a large amount of this development in the production of ammonia, methelene, etc., and have used many compressors operating in a range of from 5,000 to 15,000 pounds final pressure. It seems that there is no limit to what can be accomplished in the way of re-arranging the molecules of various combinations of gases to manufacture different products when the proper pressure and temperature in conjunction with the proper catalyst is used. We look to further great strides in the use of high pressure compressors for this kind of work in the future.

In the oil and gas industry the use of high pressure compressors is increasing at a very rapid rate. In the transmission of natural gas through pipe lines, covering a period of about forty-five years, line pressures have steadily increased until 700 to 1,000 lb. lines are common for consideration. Conservation measures are gradually causing more and more gas to be returned to the formation, either directly from the separators, or through recycling plants where the gasoline content is recovered during the process. Pressures for this work depend on the depth of wells, the permeability of the sand, length of lines, etc., and pressures of from 4,000 to 6,000 lbs. are not uncommon. Higher pressures are undoubtedly coming in the future as deeper structures are discovered.

For main gas pipe line work the compressor units are usually gas engine driven of from 800 to 1500 hp. For many years these were of the horizontal double acting twin tandem type with direct connected horizontal compressor cylinders. These cylinders were of the double acting type, the old models having poppet valves; however, for the past twenty-five years they have been mostly of the plate type which allow higher rotative speeds. These cylinders are of cast iron construction in the lower and medium pressures but often steel construction in ranges of 700 to 1000 lbs. A typical medium pressure design is shown on Plate 1, consisting of a central body usually with a removable wet liner and two heads containing the valves with passages back to central intake and discharge connections.

Of recent years angle type engines have been introduced running at higher speeds and both four and two cycle. Compressor cylinders, both of the design shown in Plate 1 and a lower cost design without removable wet liner (although a dry liner can be used if desired) and with valves in the main body and either one or two very simple removable heads as per Plate 2 have been used on these higher speed engines and motor driven compressors.

For the next higher pressure range of compressors for repressuring, recycling, and process work, double acting cylinders are also used but certain disadvantages develop. It becomes unsafe to use cast iron for such pressures and it becomes very difficult to make steel castings with the intake and exhaust passages as well as valve openings cast in one piece as per Plate 2 and the junction of the passages with the flange connections becomes the weakest part of the design. To make a design as per Plate 1 for such pressures would involve a very difficult gasketing job between head and cylinder body, particularly around the intake and discharge passages.

Plate 3 shows a design of double acting cylinder capable of covering a range of from 1,000 to 2,000 lbs. which obviates these difficulties. The two heads are of steel castings as is also the outside jacket of the body. This body is shrunk on to several circumferential ribs of a cast iron liner, the spaces between forming a water jacket. Thus the wearing qualities of a cast iron bore are combined with the strength of the steel jacket. The pressure is held by a copper gasket between the head and liner while the water is sealed by means of a gland and rubber grommet. The inlet and discharge piping is flanged directly to the heads, thus avoiding all flat gaskets. This piping can be in the form of a U connection with common outlet as per Plate 4, Fig. 1, or individual outlets extending down to headers below as per Fig. 2. This is an excellent design for strength but does have the disadvantage of requiring the breaking of a pipe joint to remove a head.

For the next higher pressure range up to 4500 lbs., it is advisable to go to forged steel bodies with dry cast iron liners shrunk in. Such a double acting cylinder is shown in Plate 5. The body is a heavy walled steel forging with a light steel band welded to the outer periphery forming a water jacket. A solid forged steel head with unloader valve is inserted in the outer end and a high pressure rod packing in the other. The suction and discharge passages are drilled into the body and provided with adequate forged steel flanges. The piston is of solid cast iron. The rod is 1045 steel for the lower end of the range but it is desirable to case harden it for the upper end of the range.

For still higher pressures for a given horsepower the cylinder becomes so small in relation to the diameter of the piston rod that the displacement on the rod end is so small in relation to the other end that it scarcely seems worthwhile to provide valves, gaskets, etc. for the rod end and also subject the packing to the full discharge pressure. To obviate these disadvantages, single acting cylinders of many different designs are used.

One of the simplest forms of single acting cylinders is made just

# OK! HERE IT IS!

*The New*

## RUST-RESISTING

## PACIFIC PUMPING UNIT

For years there has been a demand from operators for rust-resisting pumping units. Units with a finish that defies rain, snow, fog, frost and humidity. Units on which the finish does not crack, chip and peel. Exhaustive tests indicate Pacific Pumping Units now have a protective finish which multiplies paint life several times compared to the best finish previously available.

Every Pacific unit now being manufactured has the advantage of this new protection. It cuts maintenance costs and keeps your pumping unit looking "ship shape."

**OTHER PACIFIC PUMPING FEATURES**

- Rugged herringbone-type reducers
- Improved bar-type pitmans with self-aligning bearings
- Pacific safety-brake
- Economy counterbalance

*Write or phone for further details*

★ ★ ★ ★ **PACIFIC-WESTERN** ★ ★ ★ ★

**GEAR PRODUCTS**

PACIFIC GEAR & TOOL WORKS
1035 Folsom St.
San Francisco 3, California

WESTERN GEAR WORKS
417 9th Ave. South, Seattle 4, Wn.
Lewis Bldg., Portland, Oregon
Los Angeles, Cal. - Lynwood, Cal.

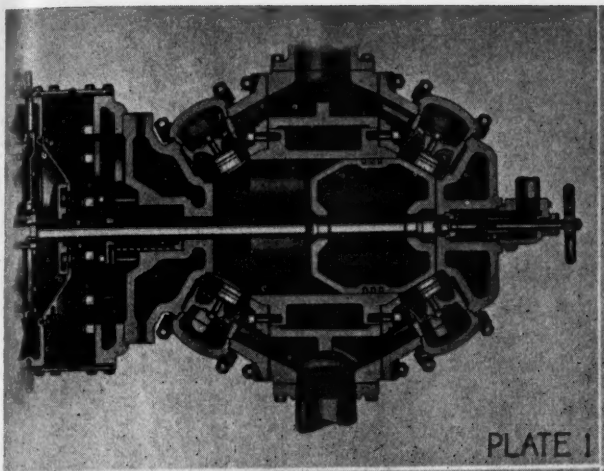


PLATE 1

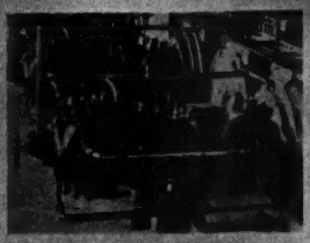


FIG 1

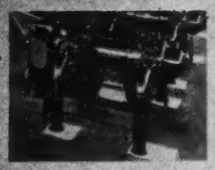


FIG 2

PLATE 4

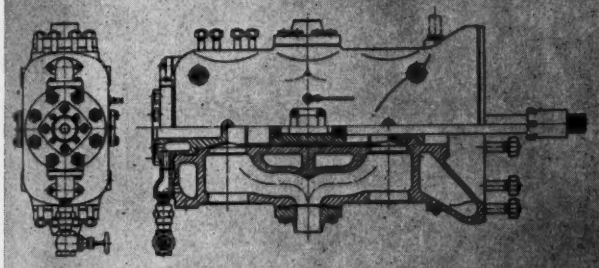


PLATE 2

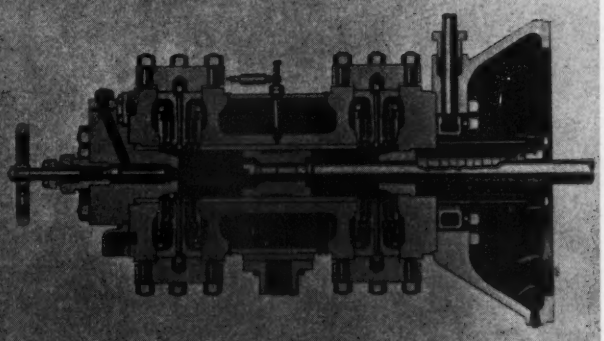


PLATE 5

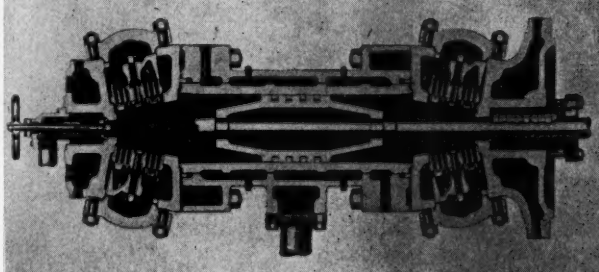


PLATE 3

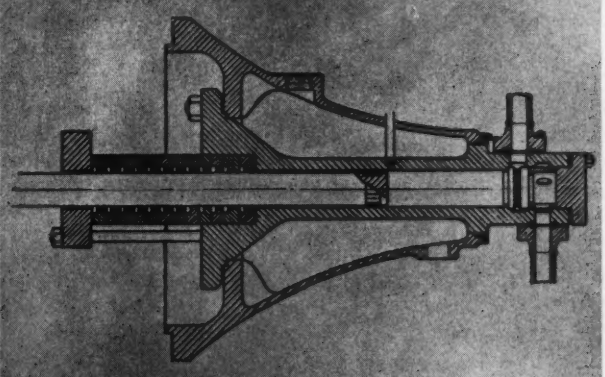


PLATE 6

like an outside packed plunger water pump, see Plate 6. The plunger rides through a packing but free of the cylinder wall except for a band of bronze or other anti-friction material which carries the weight and centers the plunger. Intake and discharge valves are provided at opposite end from the packing. The advantage of this design is that a hardened plunger can be used which is much easier and less expensive to make than a hardened liner. This type is usually only used on very high pressures, from 5,000 to 15,000 lbs., where there would be practically no differential between rod and piston, if a double acting design were used.

The disadvantages are that the entire circuit of pressures from suction to discharge and back again must be carried on a rod packing giving no relief at all from relatively high pressures. It is usually considered easier to maintain piston rings than rod packing. Another disad-

# THE STANDOUT NAME IN *Power Rigs...*

**The thing that makes a drilling rig great is *performance*. And, as for yourself, you can gauge your success in drilling and the amount of profits you realize, to an important extent, to the performance of your rig.**

**Because Wilson Rigs are engineered to give advanced drilling performance—with power, speed, easy operation, and economies you've never experienced before—they have established themselves as *standouts* in a truly modern power rig. Of course, you are the final judge, and we want you to sell yourself on a Wilson Rig. From then on, you'll always use Wilson Rigs.**

**H&B SALES CO.**

2875 CHERRY AVE., LONG BEACH 6, CALIF.

PACIFIC COAST REPRESENTATIVES FOR

WILSON RIGS and WINCHES

vantage is that the entire circuit of pressures must be carried on the bearings of the prime mover whereas with a double acting cylinder whatever area is left on the rod end times the pressure at any point in the stroke is balancing that much of the load on the other side of the piston. Another disadvantage is that the heat of compression is exposed to the full length of the rod inside the cylinder.

The next one in simplicity is similar but has rings on the plunger so that the packing only has to handle leakage as per Plate 7. The space between the plunger and packing is vented off either to atmosphere or to some lower stage of pressure.

The two designs, Plates 6 and 7, have an unique valve arrangement, See Plate 8. Both suction and discharge valves are in one piece and held in the end of the cylinder by a simple cylinder head. Groove A and corresponding side opening constitute the inlet passage and Groove B the discharge. C is a combination valve seat with a sealing ring D between suction and discharge. A series of diagonally drilled holes connect passage A to the valve port and suction valve E with its guard and springs covers the port. The discharge goes through a series of holes to the opposite side of C where they are covered with discharge valve F and corresponding guard and springs. A spacer G with sealing ring H transmits the pressure from the head to the valve seat so that all joints are in series and one bolting holds all joints. This is a very satisfactory design, both from the standpoint of accessibility and the fact that only small holes need be drilled laterally for inlet and discharge passages as compared to what they would be if lateral valves were used. The clearance volume is also a minimum.

Where there is a differential between the diameters of the rod and piston required but not enough to warrant putting in valves, etc. for use double acting, a very good design can be made from standard double acting parts. Plate 9 shows such a cylinder. The head, body, and piston are the same as shown on Plate 3. In the place of the rear head is a spacer piece containing a simple low pressure packing. The space between will have a displacement equal to the differential area between rod and piston times the stroke. This space has an opening which can be used to vent to atmosphere or some low pressure stage or it can have installed in it an outwardly opening check valve which causes a partial vacuum in the surge chamber and still further reduces the leakage through the packing. By putting a pressure packing in the surge chamber a pressure can be maintained in this chamber which will counterbalance any desired portion of the load on the opposite side of the piston.

The most efficient type of single acting compressors from several standpoints is the design using a suction valve in the piston.

Plate 10 shows a very simple type of piston inlet compressor for medium pressure. The body with both inlet and outlet connections is cast in one piece. A dry liner can be used or not as desired. Gas enters through inlet port A, passes through piston valve, through discharge valve mounted in end of cylinder bore, and out through discharge passage B. It can be readily seen that this design gives a maximum of valve area combined with a minimum of clearance volume. The entire piston area is used for a suction valve and the entire end of the cylinder is used for discharge valve while, having no valve pockets, the only clearance volume existing consists of the spaces in the valve guards and not over 1/16" lineal clearance between the two guards at the end of the stroke. If desired a clearance pocket valve opening can be used through the center of the discharge valve where the least valve area would be lost.

For very high pressures where it is necessary to use forged parts a design as shown in Plate 11 can be used. A forged barrel A is mounted in a cast iron jacket B, the space between forming a water jacket. C is an inlet pipe, and a suitable packing to withstand suction pressure only is mounted in opening D. The outlet connection E is drilled in the forged barrel and fitted with high pressure flange.

These two types are not only very efficient for valve area and clearance, but they have the same advantage as the double acting in having the differential area between piston and rod balanced by the suction pressure. During the suction stroke the only loading on the bearings is the suction pressure times the area of the rod, and during the discharge stroke is the loading of the discharge pressure times the area of the piston less the differential area between piston and rod times the suction pressure. An added advantage is that the rod packing never has to handle any pressure higher than suction pressure. Another advantage is that the clearance volume can be changed from a minimum to any desired amount by simply screwing the piston rod back into the crosshead.

Another type of high pressure compressor, although not used in large numbers, deserves to be mentioned. This compressor is called a "recirculator", see Plate 12. It is used in process industries to return gases to the system, that have gone through a catalyst, without chemically combining. By the nature of this application the temperatures are high and the compression ratio very low. It is not uncommon to see a 4500 lb. discharge with a 4000 lb. suction, or a compression ratio of only 1.2 to 1. While single acting compressors could be used it can be readily seen that high pressure would have to be carried by the bearings of the prime mover all the way around the cycle. This loading would at no time have any relief which would require larger bearings than ordinary and also the ultimate in lubrication methods. For these reasons most machines for this service have been built double acting with a balancing rod running out the opposite end from the crank. This makes a true double acting compressor in that the displacement is exactly alike on both ends and the high suction pressure completely balances the corresponding amount of discharge pressure. The disadvantage, however, to this type is the addition of another set of high pressure rod packing. In this case the user must choose between two disadvantages — practically unrelieved bearing loading, where the differential area between piston and rod is low and the suction pressure is high in relation to discharge, or an extra

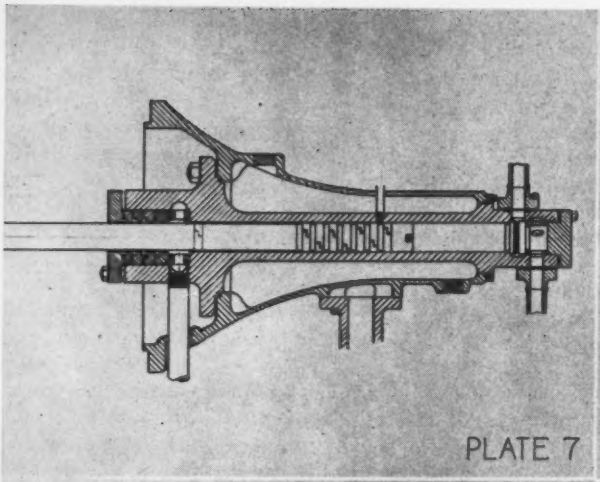


PLATE 7

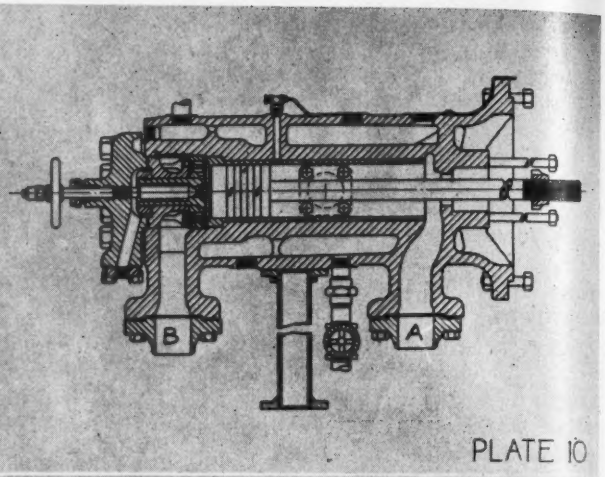



PLATE 10

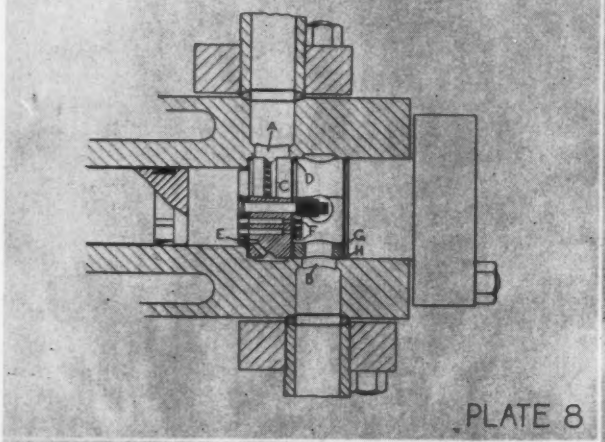


PLATE 8

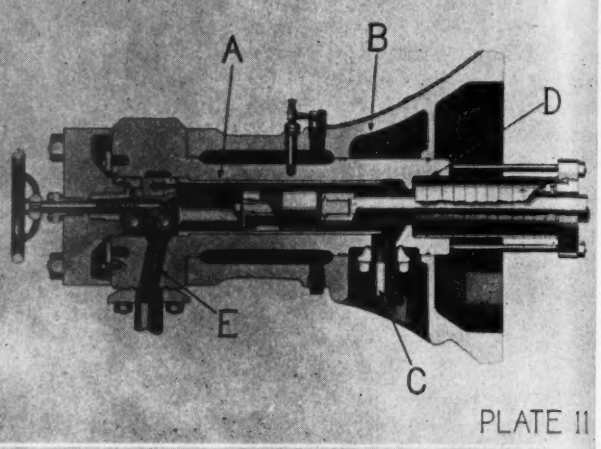



PLATE 11

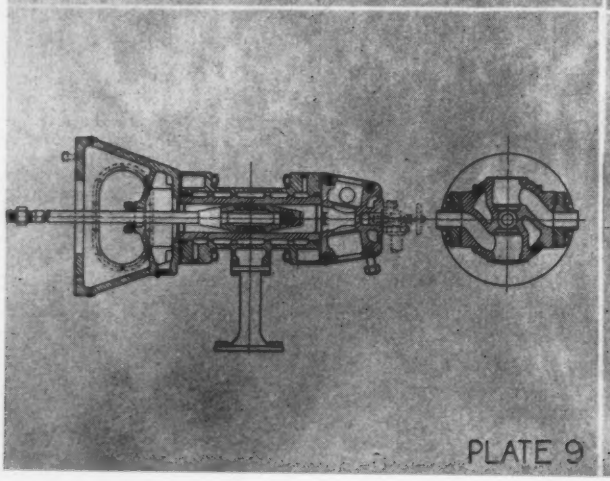


PLATE 9

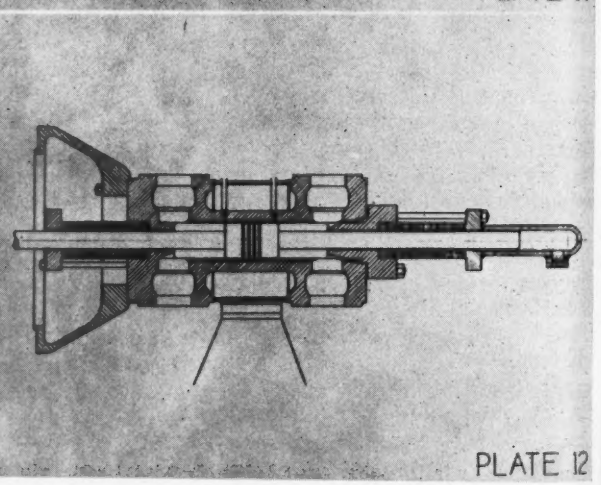


PLATE 12

set of high pressure rod packing.

It has been previously mentioned that single acting compressors similar to Plate 6 and Plate 7 have the disadvantage of loading the bearings without any balancing effect. Where the compression ratios are such as to require more than one stage of compression this can be overcome and gain all the advantages of both double and single acting by combining two stages on one rod, one acting on one stroke and the other on the opposite stroke. Plate 13 shows such an arrangement. The compression space A is one stage and B is the higher stage receiving its suction from A's discharge. In this way, since the piston loading of A and B are approximately equal, the effect of balancing is exactly like a double acting cylinder. It has the added advantage of greater compactness, one crank throw, connecting rod, etc. instead of two for two stages and the timing is always right since B is always tak-

ing suction while A is discharging, thus requiring a minimum of storage capacity between stages.

The following is a discussion of some of the detail problems in conjunction with compressor design arranged under individual headings:

**Compressor Cylinder Cooling**

The requirements for cooling compressors also vary over a wide range. The only reasons for cooling are to prevent deterioration of the oil film on cylinder wall, prevent formation of carbon in piston rings and valves, prevent heat radiation to the surrounding air, and to obtain somewhat better efficiency as any heat that is given up to the jackets during compression is a saving of power. In many services the temperatures are so low that water cooling is not necessary. Certain others operating on low temperatures have water jackets to warm the cylinder bores rather than cool them to prevent fluid condensation on the cylinder bores which would injure lubrication. In some straight gas pumping jobs the temperature of the incoming gas is so low that condensation would result if warm water were not kept in the cylinder jackets.

The chart on Plate 14 shows the increase in temperature with the compression ratio. Curve A is based on Mr. G. G. Brown's enthalpy curves for .60 gravity gas with the base pressure at 14.7 psia and the base temperature at 60° F. Curve B is based on perfect gas laws with the same base temperature and pressure. From this it can be readily seen that for very low compression ratios little or no cooling is required, while for the higher ratios cooling becomes very necessary.

**Piston and Rod Loadings**

Piston loading, as far as stresses on the parts are concerned, is easy to determine. The peak differential pressure, viz., discharge pressure minus suction pressure, times the largest piston area likely to be encountered for a given horsepower, will give the maximum loading on rods, crossheads, etc. The piston rod is usually the highest stressed member so an area at the root of the thread which will give a stress of around 6000 lbs. per square inch for 1045 steel will be adequate. The bearing situation, however, becomes entirely different because a duration factor must be introduced and these duration factors vary over a wide range. The longer the duration of the loading, the more opportunity there is for the oil film to be squeezed out and the more heat is generated in the bearing which in turn lowers the viscosity of the oil in the bearing.

Plate 15 shows two sets of curves to illustrate this. A compressor cylinder is assumed to absorb 200 hp at widely varying conditions. The cylinder size is assumed to be changed to meet these conditions and always absorb 200 hp.

Fig. 1 shows four curves for differential pressures from 250 to 1000 lbs. for rod load and four curves for Mean Indicated Pressure for the same differentials for compression ratios from 1.2 to 6. Observe that the rod load curve for 1000 lbs. differential starts at 42,500 lbs. for 1.2 ratio, drops to 22,500 at 2.4 ratio, and goes back up to 32,000 lbs. at 6 ratio. The M.I.P., however, drops continuously from 900 lbs. at 1.2 ratio to 326 lbs. at 6 ratio. Neither of these can be used to determine bearing sizes.

Fig. 2 shows four curves for the same differentials and compression ratios but with the time factor added. The lefthand scale represents rod load times seconds duration. Referring to Fig. 1, the rod load at 1.3 compression ratio and 1000 lbs. differential is 36,000 lbs. At the minimum point or 2.4 ratio the load is 22,500 lbs., or a ratio from high to low of 1.6 to 1. Referring to Fig. 2, the lb./sec. diagram for 1000 lbs. differential is 2600 for 1.3 ratio and 980 for 2.4 ratio, or a ratio from high to low of 2.65 to 1, or nearly twice the heating effect as if the bearings had been designed according to pressures only.

It is, therefore, very important to allow for the duration factor in designing bearings where all or a large portion of the load is for compressors which are likely to operate with a low compression ratio.

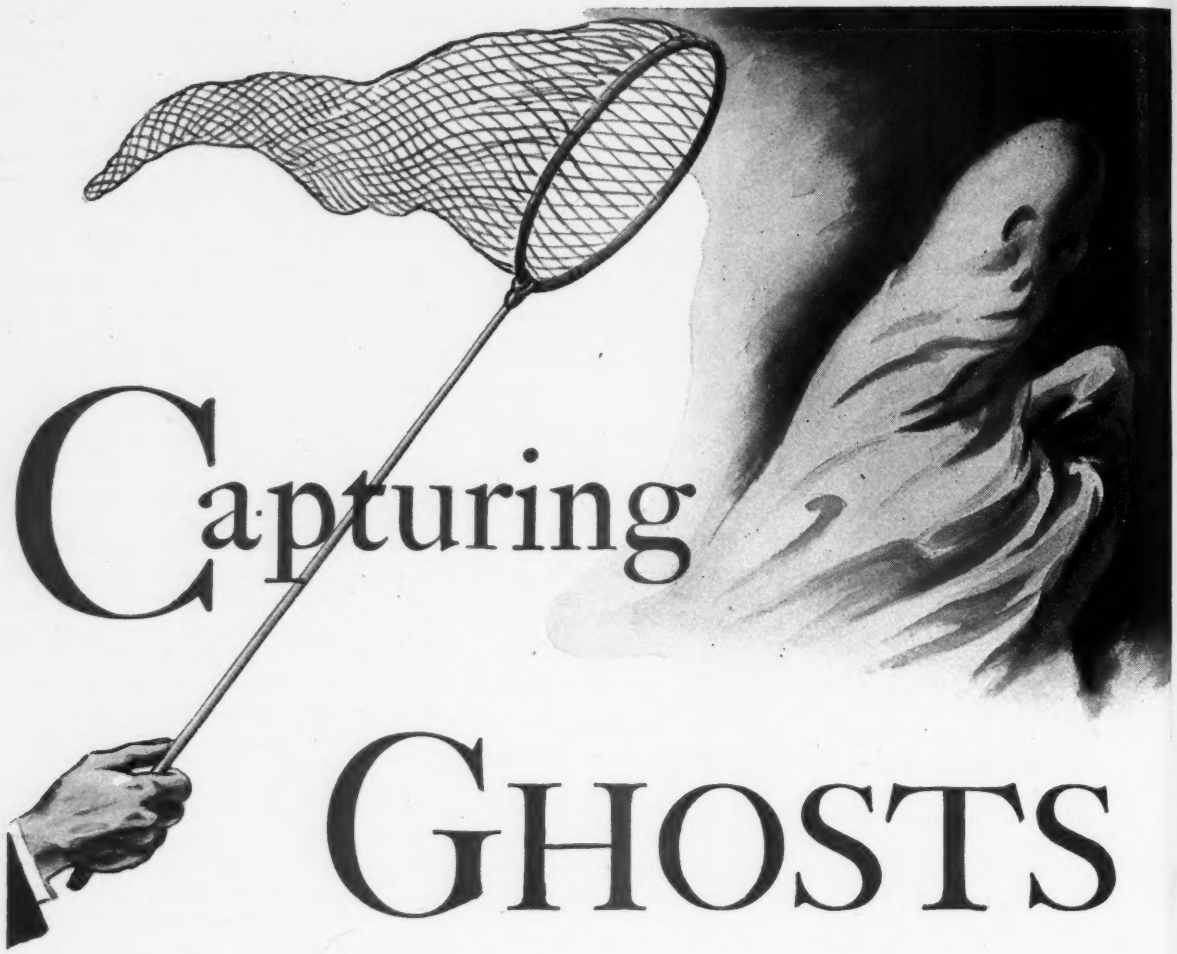
**Cylinder Liners, Pistons, and Rings**

The choice of materials for cylinder liners and rings is very much more important than material in a piston. As a usual thing a piston has a large area to ride on in proportion to its weight in the case of horizontal cylinders, and in the case of vertical cylinders there is no pressure at all on the cylinder wall as a result of piston weight. Compressors for the subject services, representing a great preponderance of the horsepower used, are driven from cross heads so that there is no connecting rod thrust to carry. In case the weight of a horizontal piston produces a cylinder wall loading that might be a little on the high side, it is an easy matter to build the piston with anti-friction bands which carry the weight and are not difficult to replace.

In the case of cylinders and piston rings, extreme care should be taken in the selection of materials. The unit pressure of the piston ring against the cylinder wall is almost up to the pressure of the gas in the cylinder. Only the leakage or blow-by past each ring has any counterbalancing effect. In the case of a 4000 to 6000 lb. cylinder we are expecting a piston ring to run against a cylinder wall with two to four times the unit pressure that we expect of the best constructed bearings, with anti-friction bearing material, hardened pins, shafts, etc. and with force feed flush lubrication. We expect all this to be accomplished with a very minimum of lubrication and in many cases a generous supply of pipe scale, sand, and other forms of dirt as well as water, hydrocarbon condensates, mineral seal oil, etc. coming through with the gas.

Most manufacturers of cylinders and rings have their own preferred analysis, particularly in the cast iron field, so I will not attempt to give any specific analysis of iron but I will caution that any iron used for liners or rings should be as low as possible in free ferrite.

It has been rather well established that the wearing characteristics of gray cast iron are fundamentally tied in with its microstructure. In order to give good wear resistance, cylinders and piston rings must have a truly pearlitic matrix with a random distribution of the graphite flakes such as is illustrated in Plate 16, Fig. 1. Any deviation from such a structure is decidedly detrimental to the wear resistance. For example, the presence of free ferrite such as is shown in Fig. 2



# Capturing GHOSTS

WE transform "ghosts of ideas" into practical, useful realities which the oil industry can use profitably.

This is often a long and painstaking proceeding. Most new ideas start as untried possibilities surrounded with obstacles and difficulties.

Several years of research and experimentation may be needed to make the idea work, to eliminate difficulties, to design and redesign the equipment, to determine procedures and costs, to develop control and metering devices, and to work out processes for the recovery of by-products and reactants.

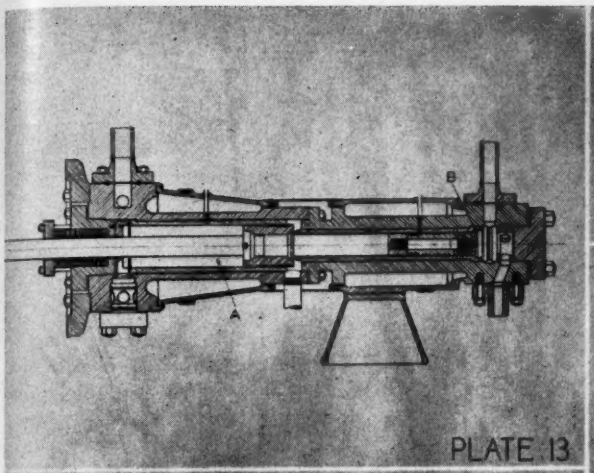
Complex patent situations may have to be studied and practical solutions worked out.

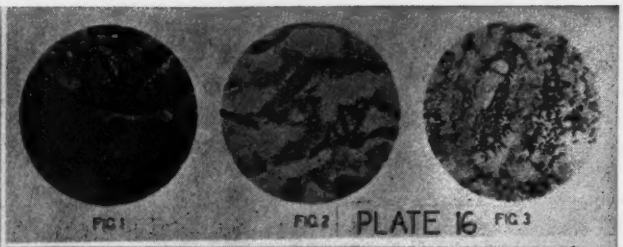
Finally the idea must be commercialized by relating it to other oil industry practice and demonstrating its special advantages.

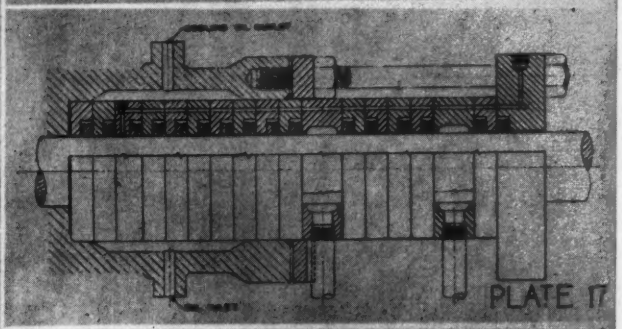
Then, and only then, can an idea go to work . . . cutting costs, improving quality, increasing volume of production . . . for the benefit of the industry.

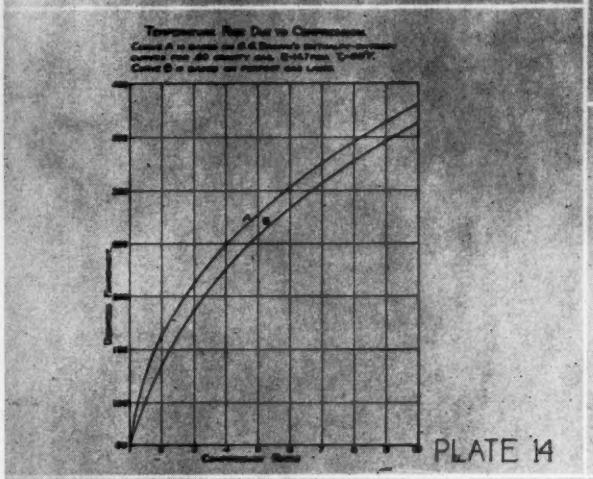
**TEXACO DEVELOPMENT CORPORATION**

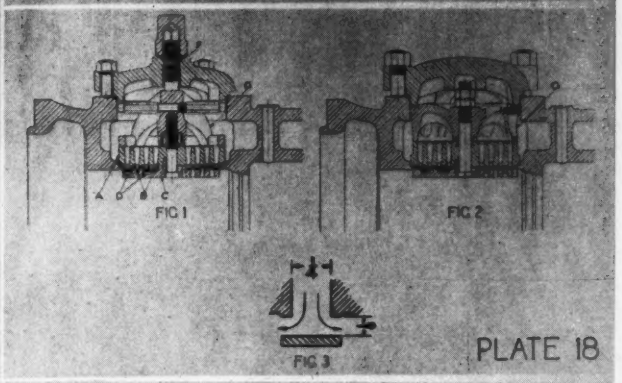
*A Subsidiary of The Texas Company*

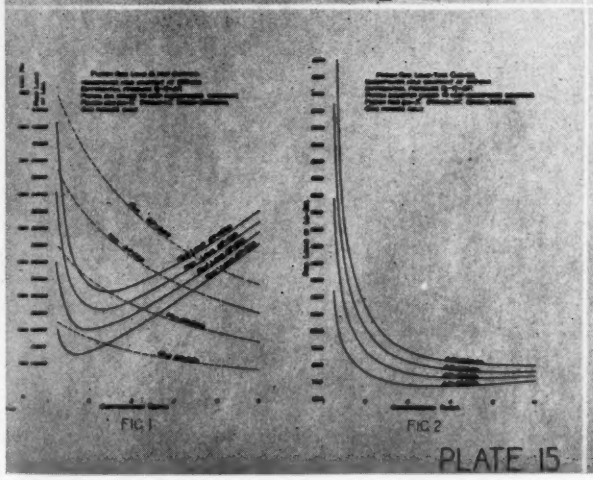


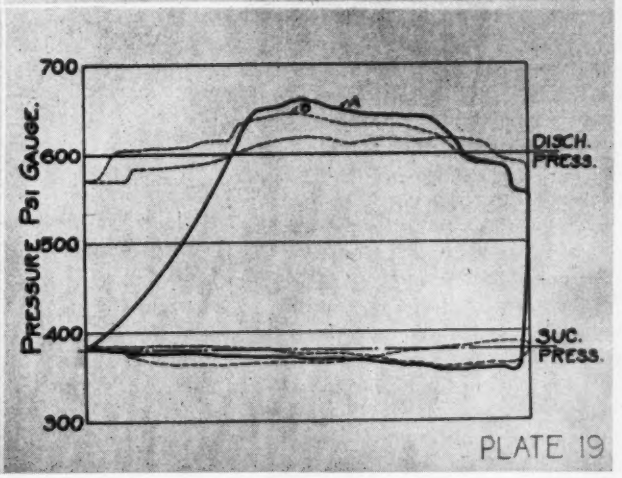




lowers wear resistance considerably. On the other hand a distribution of the graphite other than random flake such as the eutectiform, as is shown in Fig. 3 gives exceedingly poor wear resistance. This type of distribution is always associated with free ferrite as shown in the photomicrograph.

Fortunately, the best physical properties and hardness are associated with the pearlitic matrix and random flake distribution of the graphite. Hence, we have found that for a minimum Brinell hardness of approximately 180 it is necessary to provide this structure. This hardness also provides sufficient strength in the casting to withstand the stresses imposed on it.

Addition of alloys to gray cast iron to refine and stabilize the pearlitic matrix is sometimes desirable. To do this the addition of a combination of nickel, chromium and molybdenum is often practiced. The general rule being that carbide sta-

bilizing elements such as chromium added in combination with grain refining elements such as nickel and molybdenum give excellent wear characteristics. Because phosphorus forms a hard iron-phosphide eutectic (Steadite) which is held firmly in the matrix it in many cases also is added to improve wear resistance.

A booklet on "Wear" by Dr. Francis P. Bundy, T. E. Eagan, and R. L. Boyer, which will cover this subject from the angle of the Physicist, the Metallurgist, the Designer, and Lubrication Engineer, is in preparation and will be available around the first of 1946.

Pressures up to 6000 lbs. have been used with cast iron liners and cast iron rings. For higher pressures hardened steel cylinder bores or plungers with bronze rings are used.

The proportions of the piston rings are important but the ideal is almost impossible to accomplish in compressor cylinders. In general, the narrower the face of the piston ring the better, as the pressure loading on the cylinder wall is directly proportional to the width of the ring. Scientific proof of this will be presented in the booklet on "Wear" referred to.

A narrow faced ring will therefore generate proportionately less frictional heat on the cylinder wall, will seal better in that it can follow slight deviations in the cylinder wall better, and it has correspondingly less inertia for pounding out the sides of the ring grooves. This ideal is difficult to attain in many high pressure applications. The narrow faced ring is inherently a snap ring and since most high pressure cylinders are of small diameter the depth of the ring is therefore limited to what can be snapped over the piston without distortion.

Where conditions of cleanliness and good lubrication are present these small section snap rings have given excellent service, however, where certain amounts of condensate are unavoidable and where appreciable amounts of heavy lubricants cannot be tolerated in the finished product, rings of resinous plastic, or carbon, or mixtures thereof, give better results than metal rings. Due to their low physical properties and the desirability of getting as much ring depth as possible, these rings are made segmental with a steel expander ring underneath. These rings are usually in three segments with three joints, therefore, it is important that they be of the sealed joint type. Bronze rings of this type are very satisfactory where the gas is clean enough. Any soft metal used as a ring has a tendency to load up with dirt and form a lap for the cylinder bore. Cast iron segmental rings have no advantage over the cast iron snap rings except they have more depth and under the same conditions of wear last longer before replacement is necessary.

Compressor pistons are scarcely ever artificially cooled because of the moderate temperatures encountered. However, the temperatures they do encounter vary with the compression ratio so that to be safe the piston to cylinder clearance is usually made to take care of the highest ratio that is likely to be encountered, or about 6 to 1, giving about 285° to 300° F. temperature, and a clearance of .0015" per inch diameter, with a plus and minus tolerance of .002" to .010," depending on the diameter of the piston. Since high pressure cylinders are small in diameter this clearance is so small that the effect of misalignment with the crosshead is not enough to affect the running of the crosshead. If undue wear takes place on the bottom of the piston so as to tilt the crosshead enough to make it run hot, it can be corrected by turning the piston to a new bearing position. This can be done three or four times before the piston needs to be replaced.

As to the exact amount that a piston can be allowed to sag below the centerline of the crosshead, only experience with each individual design could guide the operator. The unit pressure on cylinder wall caused by the tension in the ring itself or the expander spring is so small in comparison to the pressure caused by the gas pressure as to be of no consequence. A unit pressure of 12 to 16 lbs./sq. in. is very satisfactory although higher pressures can be used with safety. With snap rings it is usually desirable to use a rather high tension as the ring will then have more follow up before it need be discarded.

The piston to cylinder fit has practically no effect on leakage past the rings. The trueness of the bore, the uniformity of wall pressure of the ring, and the flatness and perfection of the side surface of ring and groove are the main factors in leakage. The outer surface of the ring will in time "seat" itself into the cylinder bore but imperfections in the side surfaces will never correct themselves.

The number of rings on a piston is a function of the differential pressure handled. Only the first few rings toward the pressure are effective and the only reason for putting a large number of rings on a piston or rod is to have a reserve in case the first rings get worn to the extent of excessive leakage, so that a longer run could be made before shuting down. 6000 lbs. have been successfully handled with six rings.

The side clearance in ring grooves should be as low as can be used without sticking. Excessive side clearance will allow the ring to slap back and forth in the groove and eventually the impact will pound out the ring lands at an ever increasing rate.

Ring gap is determined by the maximum temperature at which the piston is to be operated and should be as small as can be used without the ends butting at the maximum temperature. A good figure for this is .003" per inch of diameter.

### Piston Rods and Rod Packing

Piston rods, except for some special reason such as handling corrosive gases, are usually made of about a 1045 steel for differential pressures up to about 2000 to 3000 lbs. Above this they are case hardened. The hardness should increase with the pressure. Where corrosive gases are encountered a solid stainless steel rod has been used but due to the tendency for this material to work harden under friction and the difficulty of maintaining a uniform degree of friction on all portions of the rod, they have a tendency to warp. It is now considered better practice to make the rod of ordinary steel and metal spray it with the desired composition of stainless material. This practice not only gets away from the warping but due to the porosity of the sprayed surface

is much better for holding lubrication.

On high pressure work rod packing is almost entirely of the metallic segmental ring type and there have been so many different designs used that it would be impossible to cover them all in this paper. The cases are usually of cast iron rings with ring recesses cut in one side of them which when stacked up axially form a series of ring grooves. Thus a packing for any desired pressure can be built up out of the same parts. At the outer end is a flange which holds the sections and at the same time holds the packing in the head recess by means of bolts into the head. There is no particular grade of metal needed in the case, other than that it be strong and close grained. The metal in the rings however is even more sensitive than piston rings. Piston rings almost always ride on a cast iron or hardened steel surface while rod packing rings ride on all sorts of variations in rod material. The rings are segmental of a great variety of designs, often two in a groove, with joints mismatched and held together by a long slender coil spring called a garter spring with ends hooked together in a groove on the outer periphery of the assembled ring. Cast iron is the most common material used although various bronzes, Bakelite, Micarta, carbon, etc. are all used where the conditions demand. All the conditions, such as unit pressure, side clearance, etc., that apply to piston rings, also apply to rod packing rings.

Rod packing has one feature for high pressure work that would be impractical for piston rings, that is it can be built in as many stages as desired. See Plate 17. A spacer ring can be inserted at any place in the packing with a vent connection to the outside which can be piped to any desired lower stage. This way the high pressure can be absolutely prevented from reaching the outer sections of the packing.

If the inner or high pressure stage gets to leaking too badly the vent connection will become hot and warn the operator before disaster happens. The last vent connection is often connected to atmospheric pressure and piped outside the building so that it is practically impossible to leak gas inside the building. Plate 17 shows a three stage packing with the first vent carried to a lower stage pressure or if single stage to the suction pressure, and the second carried to atmosphere. In many cases the outer stage is made of ordinary soft packing which can be tightened up "bottle tight" during a shutdown period but must be loosened again when starting up.

### Compressor Valves

In dealing with this heading we will consider only the almost universally used plate type of valve. Plate 18, Fig. 1, shows an example. A is the valve seat with concentric circular ports. B is the hardened steel valve plate which covers the ports. C is the valve guard which contains the spring pockets, guides the valve, and limits the lift of the valve. D are springs which return the valve to the seat. E is a valve cap bolted to the cylinder body or head and holds the valve to its seat by means of a center jack bolt F acting on a spider G or directly on the periphery of the spider as shown in Fig. 2. The lift of the valve must be definitely limited or the impact between the valve and the seat and guard will cause undue valve breakage. ⅛" lift is about the maximum that can be used, however, this varies somewhat with the number of strokes per minute, the differential pressure on the seat, and the velocity of the gas. Since the lift is limited the effective port width is limited accordingly. Referring to Fig. 3 it is obvious that for a lift of ⅛" a port width of over ¼" would not gain any increased net area but would limit the number of ports that could be used in a valve of given outside diameter. For a given valve velocity the outside diameter of the valve would be increased by wide ports thereby limiting the number of valves that could be used in a cylinder and also adding decidedly to the clearance volume.

As a general rule it is desirable to keep the gas velocity as low as possible to avoid unnecessary work loss; however, the ideal is impossible to attain in most cases. Because larger valves on these small bores mean rapidly increasing clearance volume in the valve pockets, it is difficult to get the velocity below 5,000 to 6,000 feet per minute. In adding to clearance a vicious circle is started, as the larger the clearance the larger the cylinder bore for the same capacity and therefore the larger the loading on bearings and other parts and the lower the mechanical efficiency. This applies to all designs with side outlet valves but not to designs as shown in Plates 6, 7, 10, and 11. Most manufacturers have certain ranges of cylinder bores in any one design. It is obvious, therefore, that the larger bores in any series will have higher valve velocities than the lower ones.

Other limitations have to do with relative spring loading, spring frequency, and gas velocity. If the velocity is too low the kinetic energy of the gas impinging on the valve plate is not enough to overcome the spring load sufficiently to hold the plate against the guard, then the plate will only partially open and develop a high frequency "flutter" which damages the springs and adds to plate breakage. The seat area should be as low as mechanically safe, therefore, the seat unit pressure will be as high as can be tolerated without undue seat deterioration. When the valve is closed, the pressure on the back side of the valve times the sum of the port area and the seat area must be overcome by pressure times port area alone from the underside. From this it can be seen that to open the discharge valve the pressure inside the cylinder must increase above the discharge pressure enough to overcome the differential of the seat area. When the valve cracks open this higher pressure is immediately applied to the full area of the plate which imparts to it a high velocity and a corresponding high degree of impact against the guard.

The thickness of the plate should be as low as can mechanically bridge the port without undue stress and have reasonable seat life. The heavier the plate, the greater the impact on both guard and seat. For pressures up to 2500 lbs. and a port not over ¼" wide, a properly heat treated chrome vanadium plate of a thickness of 1/16" is satisfactory. For higher pressures proportionately thicker plates or narrower ports are necessary.

A great many times valves and

# AEROFLO...QUADRAFOS...

## "WITH THEIR HELP WE NOW HAVE THE SITUATION WELL IN HAND"...SAYS "GENERAL" MUD

With deeper drilling the order of the day, keeping drilling mud under control at all times *and at all points* from bit to surface demands careful planning—and *reliable* mud conditioning chemicals. QUADRAFOS*and AEROFLO*have proven their efficiency for this purpose over and over in all types of drilling conditions. They can be depended on to meet practically any situation that may be encountered in both domestic and foreign fields.

**QUADRAFOS** offers special advantages. It maintains fluidity even with high concentrations of colloidal material... helps to assure low water loss and moderate gel strength. It dissolves easily in water and is particularly well adapted to field use.

**AEROFLO** is excellent for use under difficult conditions and in deep wells. It increases the efficiency of phosphates in salt cut muds, in muds that do not respond to regular chemical treatment, and where high temperatures cause rapid thickening. It improves elimination of sand with or without special equipment.

**BOTH QUADRAFOS and AEROFLO** are manufactured in large volume with modern equipment under careful control... and are available for immediate delivery from distributors in all the principal oil drilling centers of the U. S. A. For complete information and technical assistance write, phone or wire American Cyanamid & Chemical Corp., 229 Shell Bldg., Houston, Tex., or Azusa, Calif.

*Reg. U. S. Pat. Off.

**†QUADRAFOS and ‡AEROFLO are available for immediate delivery from stocks kept by many Drilling Mud Chemical Distributing Houses in all principal Oil Well Drilling Centers in the United States.**

**‡AMERICAN CYANAMID & CHEMICAL CORPORATION**
*(Manufacturer and Selling Agent)*

**†RUMFORD CHEMICAL WORKS**
*(Manufacturer)*

**†AMERICAN CYANAMID & CHEMICAL CORPORATION**
*(Selling Agent)*

*When Performance Counts... Call on Cyanamid*

American CYANAMID & Chemical Corporation

*(A UNIT OF AMERICAN CYANAMID COMPANY)*

30 ROCKEFELLER PLAZA · NEW YORK 20, NEW YORK

compressor passages are unjustly blamed for power losses when inadequate and improperly designed piping and headers leading to and away from the compressors are really at fault. This is an easy mistake to make when looking at an indicator diagram from the compressor cylinder alone. Plate 19 shows an indicator diagram reproduced from an actual diagram from a gas pipe line compressor. The suction pressure is about 380# yet a good part of the suction line shows 20# below this. The discharge pressure is 600#, yet most of the discharge line is from 40# to 60# above this pressure.

This card represents a work loss of 18% of what it should have been. However, when a simultaneous diagram is taken from the discharge and suction passages at their outlet and inlet flanges and superimposed upon the diagram from the cylinder, a different story is presented. The heavy line A is the discharge line from the cylinder while the dotted line B is from the discharge passages. The difference between these two is all that can be charged to internal resistance in the compressor and averages only about 10# where the piston velocity is highest and trails off to nothing near the end of the stroke where the piston velocity is low. The suction line shows a similar condition although not so exaggerated due to the lower density of the gas. The actual work loss chargeable to the cylinder construction is only 6.4%. This loss condition is partly due to inadequate piping and headers close up to the cylinders and the suction and discharge pressures have been disturbed by nearby cylinders taking suction and discharging simultaneously. The headers were inadequate to take care of this condition.

Another cause is pipe line pulsations caused by too small a line, therefore too high a velocity, in the line leading away from the station. This is evidenced by the fact that toward the end of the discharge stroke the pulsation was moving away from the compressor and pulled the discharge pressure in the cylinder below the normal discharge pressure. Just before the crossing of these two pressure lines the corresponding pulsation was back toward the compressor cylinder and added to the loss in work above the discharge pressure line. Few designers of compressor stations in the past have realized how serious a power loss this condition can cause.

From the foregoing it is obvious that due to the almost infinite variations in pressures, rotative speeds, specific gravity of gases, etc., coupled with limitations as to gas velocities, valve lifts, spring loadings, and frequencies, compressor valve design is largely made up of compromises.

### Lubrication

The lubrication of compressor cylinders is another complicated problem because of the great variation in the services for which they are used. In some cases the lubricant that would give the best wear resistance on the rings and cylinder bores would work through into the crankcase and gum up crankcase bearings, etc. In repressuring work such oils will clog up the sand at the bottom of the input wells and result in excessive costs for cleanout. In many other cases the use of the best form of lubricant will discolor or otherwise harm the product handled. In still other cases when compressing air for certain refinery processes, due to the fire hazard in the discharge lines, tanks, etc., a hydrocarbon lubricant cannot be used at all. In such cases soap solutions and other non-inflammable fluids are used.

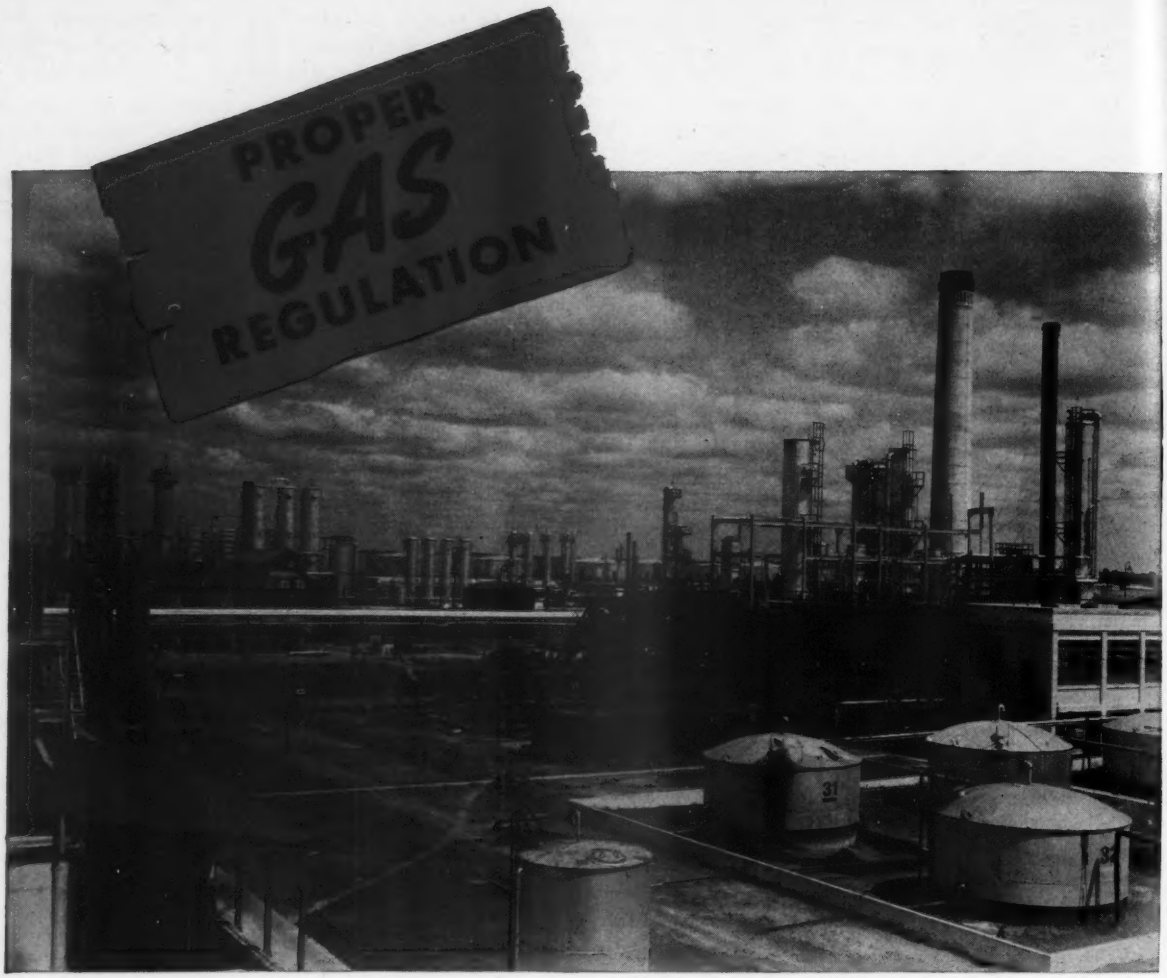
Cases are on record where the life of piston rings has been extended from a few hours to 2½ or 3 years by a change in the lubricant alone. In general, compressors for the services under consideration are not very high in rotative speed and therefore, the use of rather high viscosity lubricants are not harmful to the mechanical efficiency as they would be in high speed machinery, as for instance automotive type engines. It is, therefore, advisable to use a rather high viscosity additive oil with as great a film strength as possible. As stated before, pressures up to 10,000 lbs. per square inch are encountered between ring and cylinder wall and at such pressures if scuffing once starts it is almost impossible to heal. The use of a heavy oil also improves the seal between the ring and cylinder wall and ring lands.

There is a belief that viscosity of lube oil is reduced by absorbing high pressure gases directly. This is doubtful and no allowance is made for this in selecting oils. The problem of having liquids condense on the cylinder walls is very common and these liquid hydrocarbons very definitely damage or destroy the oil film. One way to avoid this is to increase the number of stages of compression, thus lowering the compression ratio in each stage and drop out and trap off the condensates in intercoolers. Another is to keep the cylinder wall hot enough to prevent the condensation on the wall itself. As a last resort, if condensation cannot be avoided, a lubricant must be used which is not affected by the hydrocarbons. In some cases carbon rings with no lubrication whatever have been used.

It is also believed in some quarters that the viscosity of lubricating oil is reduced by pressure. The opposite of this is true. The viscosity is increased by pressure and theoretically pressure can be increased to where the oil will solidify. Paraffin oils are less affected by this action than naphthenic base oils but since no harmful effects have been encountered in compressors covered in this paper, the pressures to produce solidification must be extremely high. The rings have no effect on this as the ring pressure on the wall is the same or less than the gas pressure.

In conclusion it must be quite evident from the foregoing that compressor design presents complicated problems, due to the large number of variables encountered, such as horsepower, gas capacity, discharge pressures, compression ratios, gas composition, temperatures, line pulsations, number of stages, etc. It is almost impossible to standardize because demands vary from suction pressures of minus 28" of mercury to 6,000# and in some cases as high as 15,000# discharge pressure. To somewhat mitigate the almost infinite variation most builders design for a certain range of diameters in one cylinder body. In this way only

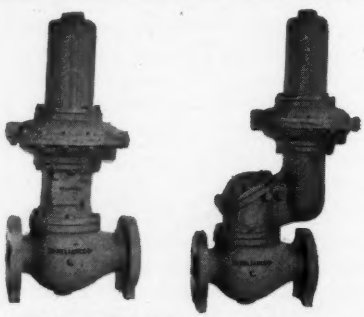
*(Continued on Page 24)*




# Is A "Must" In Refining Crude Oil

WHEREVER gas is used in the oil fields, you will find Reliance Regulators on the job contributing their part to the growing output of petroleum. They assure positive pressure regulation and control at the boilers which supply the power, and at every step from the topping of the crude to the refining of the various fractions.

RELIANCE is proud of its thirty-four year service to the oil industry building regulators you can depend on. They perform in all types of weather, under fluctuating temperatures, and variable load demands. Reliance offers a regulator which can fit every need. Write us for current bulletins giving complete information.



*Reliance CBV High Pressure Regulators are made in sizes from 2" to 10" inclusive in both direct connected and offset connected types, spring loaded, weight loaded, pilot controlled. Send for Bulletin No. 50.*

**RELIANCE REGULATORS**

RELIANCE REGULATOR CORPORATION
1900 SEABOARD AVENUE, ALHAMBRA, CALIFORNIA

**AMERICAN METERS**

RELIANCE

AMERICAN METER CO. EST. 1836

# Application of Laboratory Data on Phase Behavior to Evaluation of Condensate Reserves

By E. W. McAllister, Chief Engineer
Western Gulf Oil Company

With the recognition of the phenomenon of retrograde condensation, the petroleum engineer has been faced with a new problem in estimating petroleum reserves in high pressure condensate or distillate type reservoirs. In addition to the reserves in place, it has been necessary to estimate the additional recovery of products to be expected from this type reservoir when produced under a pressure maintenance or cycling program over that which would be recovered under a normal pressure depletion program. Also, whether or not the increased recovery would economically justify the additional expenditure required for high pressure equipment and increased operating costs of a cycling program.

While the phenomenon of retrograde condensation has been recognized in laboratory work for many years, there is still considerable lack of the specific information required to properly estimate the petroleum products which would be recovered from a condensate pool produced by straight pressure depletion. This is due to the lack of laboratory equipment suitable for running condensation or phase behavior experiments on samples involving a change in composition with decrease in pressure. This experiment involves withdrawing portions of the sample in the gas phase, causing each increment of pressure decrease and determining the composition of the portions of sample withdrawn and remaining. At present, nearly all laboratories are equipped to run phase behavior experiments involving no change in composition of the sample and showing only the indicated relative volume of liquid condensed with change in pressure and without determining the composition of the liquid so condensed. This type of data is suitable only for determining the products to be recovered at the dew-point pressure or above, with an indication of the magnitude of the rate of liquid condensation which may occur in the reservoir with pressure drop in the retrograde region.

For example, in Figure 1 are condensation curves for samples taken from two different condensate fields plotted from data from experiments run involving no change in composition of the samples. These curves are the customary type run in phase behavior experiments. The scale showing "Liquid Formation Volume — %" indicates the relative amount of liquid condensed in the apparatus at the corresponding pressure on the basis that the volume of the liquid phase of the sample originally contained in the apparatus at standard conditions was equal to 1.00 or 100%. By way of explanation, you will note the relative liquid volume as indicated by the curves does not approach 1.00 or 100% at zero pressure. This is due to the

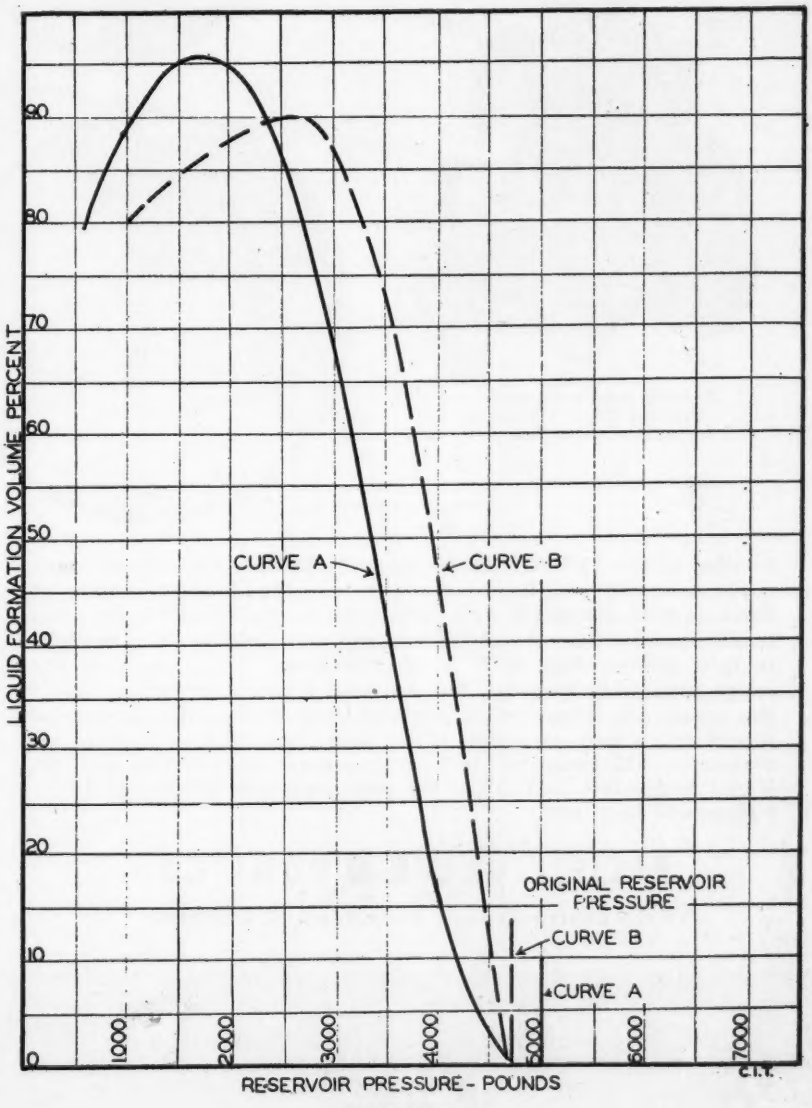
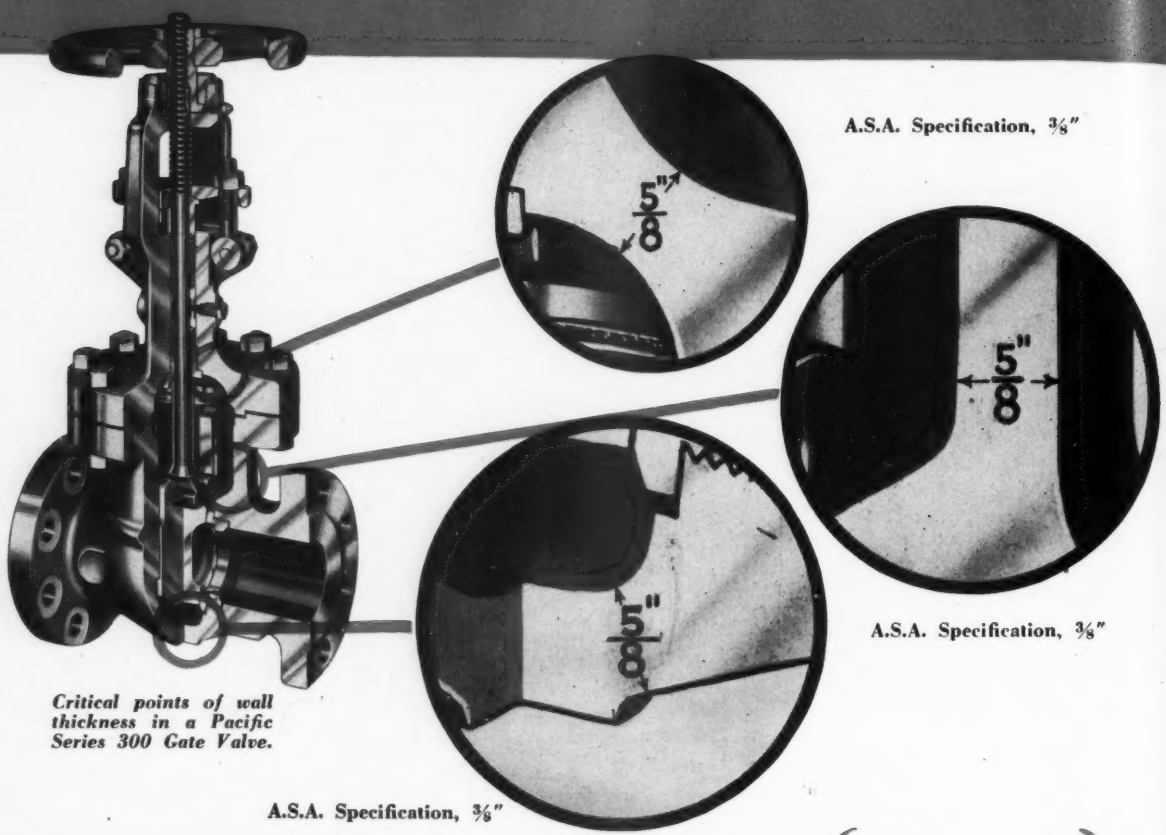



FIGURE 1

# PACIFIC VALVES FEATURE No. 4

## Wall Thickness beyond A.S.A. Specifications insures Long "Heavy-Duty" Performance




*Critical points of wall thickness in a Pacific Series 300 Gate Valve.*

**Another of the 15 FEATURES which make PACIFIC VALVES outstanding is minimum wall thickness which far exceeds specifications of the American Standards Association. In the Series 300 Valve (pictured above) minimum wall thickness to pass rigid Pacific inspection is 50% greater than A. S. A. Specifications. — Starting with the rough castings or forgings, the materials from which Pacific Valves are made are inspected at periodic steps during the process of manufacture and assembly. Final inspection of every valve includes: (a) 125-pound air test under water, each side of disc; (b) 2 to 1 hydrostatic test across the seat, each side of disc; (c) 3 to 1 hydrostatic shell test.**

*Complete your files with General Catalog 44; and the new PACIFIC Series 300 and 600 Gate Valve Catalog, both gladly sent to any oil man.*

**PACIFIC VALVE & PUMP CO.**

**2976 Cherry Avenue, Long Beach 7, California**

# PACIFIC VALVES

*Earning a Good Name in the Oil Industry*

TABLE 1

| Components | Hydrocarbons Originally Present in Reservoir Bbls./mmcf Pore Space | % | Hydrocarbons Recoverable *Cycling with subsequent Press. Depletion to 500# Bbls./mmcf Pore Space | % | By Pressure Depletion to 500# Bbls./mmcf Pore Space | % |
|---|---|---|---|---|---|---|
| Isobutane + | 23,650 | 100 | 19,240 | 81.4 | 13,680 | 57.8 |
| n-Butane + | 21,220 | 100 | 16,980 | 80.0 | 11,380 | 53.6 |
| Isopentane + | 18,710 | 100 | 14,850 | 79.4 | 9,770 | 52.2 |
| n-Pentane + | 17,490 | 100 | 13,710 | 78.4 | 8,600 | 49.2 |
| **Condensate | 17,460 | 100 | 14,430 | 82.7 | - | - |

*Assuming 70% of the reservoir cycled with a 10% pressure drop during cycling period due to removal of liquid products and gas used as plant fuel.

**Unstabilized or Raw Condensate.

experiments being run at reservoir temperature which in case of the curves in question is considerably above the standard temperature of 60° F. at which the original volume of the liquid samples were determined. As a consequence, lighter fractions originally contained in the liquid samples are vaporized due to the elevated temperatures.

From these curves are determined the dew-point pressure at which condensation starts with the attendant loss of heavier hydrocarbons in the reservoir. Also, indicated by the general shape and slope of the curves in relation to each other are the relative rates of condensation which occur below the dew-point; that is, Curve A indicates a less rapid rate of condensation immediately below the dew-point than does Curve B*. This coupled with the fact that the dew-point of Curve A is approximately 300 p.s.i. below its original reservoir pressure indicates a lower percentage of increased recovery for a pressure maintenance program than does Curve B.

However, the apparent liquid condensation below the dew-point as indicated by both curves is misleading since the volume of the condensed liquid as shown consists in part of lighter hydrocarbons (methane, ethane, etc.) in solution due to pressure and which would not be recovered as a liquid product under atmospheric conditions. Curve A, for example, indicates a liquid condensation, in relation to the original liquid sample, of 16.5% at 4000 p.s.i. pressure of which only approximately 55% is recoverable liquid. In other words, rather than 16.5% of the original liquid volume condensing at 4000 p.s.i., representing a possible loss in the formation, only about 9% of the original liquid sample is condensed. It can readily be seen from this comparison that the loss of heavier hydrocarbons by condensation in the reservoir, as determined from curves such as those in Figure 1, would not be representative of the loss which would occur in actual practice.

The possible magnitude of this difference is indicated by the curves in **Figure 2. These curves are plotted from data from an experiment run on samples from a field other than those sampled for the experiments previously discussed. The curves in Figure 2 show the condensation of isobutane, normal butane, isopentane and normal pentane and less volatile fractions with pressure drop in addition to a total condensation curve similar to those

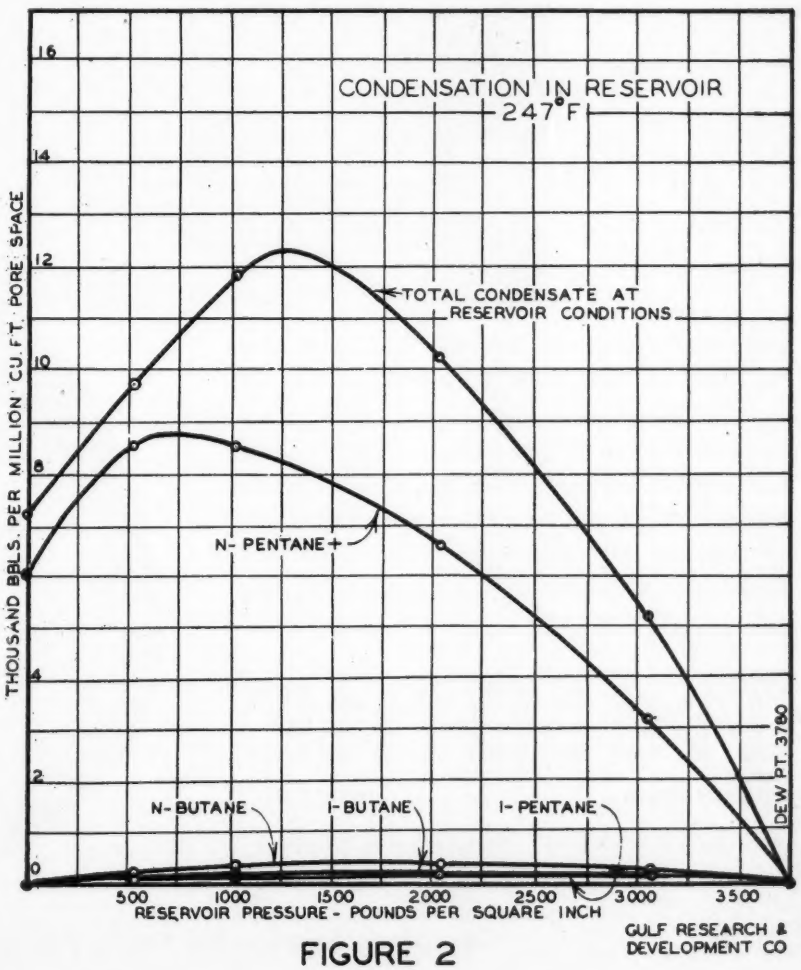



FIGURE 2

# TRETOLITE SERVICE STARTS.....

## when the Tretolite Field Engineer goes on the job

A phone call brings the local Tretolite field representative to your lease immediately. He helps you solve your crude oil emulsion problems quickly and accurately . . . chooses a formula that will do the job right—right on the job. However, Tretolite service does not stop then. Our field engineer makes frequent call-backs to check the efficiency of the Tret-O-lite formula you are using and to help you to maintain and possibly increase the economy and effectiveness of your dehydrating operations.

Tret-O-lite

REG. U. S. PAT. OFF.

**DEHYDRATING** **DESALTING**

**TRETOLITE COMPANY** *Manufacturing Chemists*

Webster Groves, St. Louis County, Mo., Los Angeles, Calif.

***Complete Service for Every Field***

in Figure 1. However, in the case of the experiment for the curves in Figure 2, the composition of the sample was continually changed by withdrawing a portion of the sample remaining in the gas phase for each decrease in pressure. This is more nearly representative of producing a field by pressure depletion than are the experiments run for obtaining the curves in Figure 1, in which the composition of the samples were maintained constant and the volumes varied to obtain changes in pressure.

It will be noted in Figure 2, the isobutane, normal butane, and isopentane fractions are nearly or completely vaporized at zero pressure. Thus, if the reservoir pressure could be completely depleted, there would be very little, if any, loss of these fractions due to condensation within the reservoir and consequently no benefits would be derived from a pressure maintenance program. In the case of the normal pentane and heavier hydrocarbons, the curve indicates these fractions do not completely vaporize at zero pressure and also the condensation of these fractions reaches a maximum at approximately 600 p.s.i. This pressure is only slightly above the pressure range which is normally used in estimating the pressure remaining in a reservoir at abandonment. The difference between this latter curve and the curve showing total condensation, which includes methane, ethane, etc., will be noted.

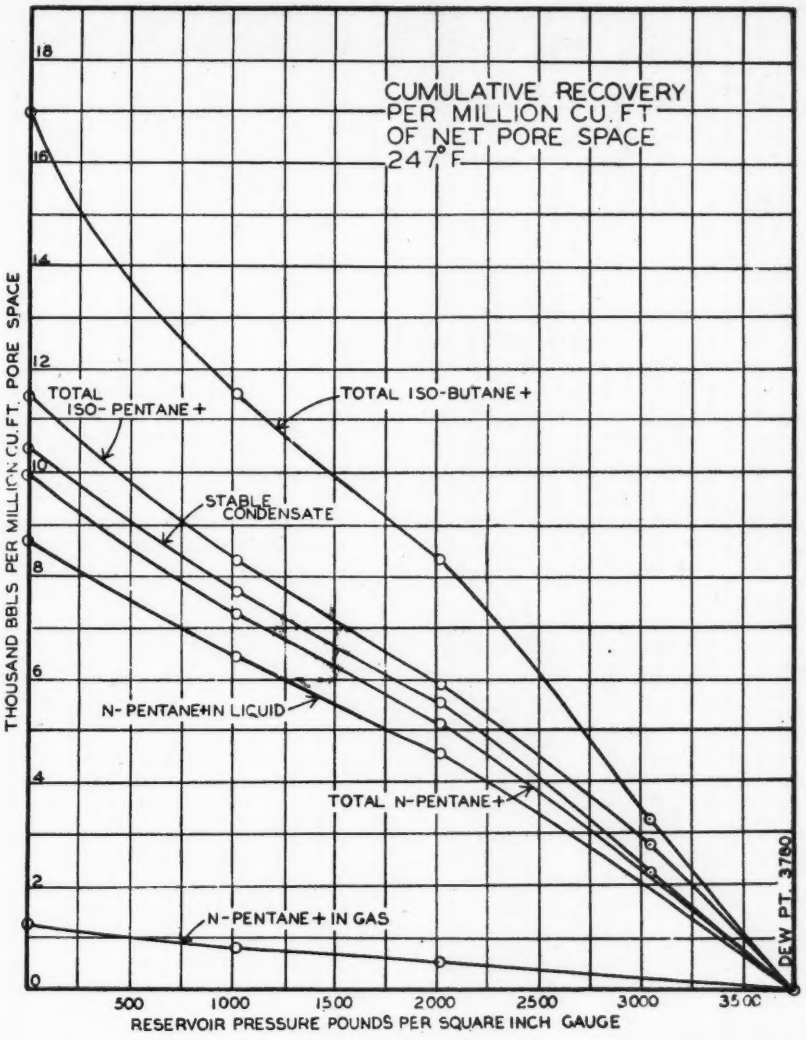



FIGURE 3

GULF RESEARCH & DEVELOPMENT CO.

The curves in Figure 3, plotted from data obtained from the same experiments as the curves in Figure 2, indicate the cumulative barrels of isobutane and heavier, isopentane and heavier, and normal pentane and heavier to be recovered per million cubic feet of pore space as a function of pressure. Assuming no repressuring effect from edgewater, the ordinates of these curves multiplied by the net pore space of the reservoir in millions of cubic feet will give directly the production of each product which can be expected by producing the field by pressure depletion to any reservoir pressure.

The curves in Figure 4, also plotted from data from the same experiments as the curves in Figures 2 and 3, show the barrels of each component in the stable condensate per million cubic feet of high pressure separator gas which will be produced at the various reservoir pressures. From these curves the amount of gas which would have to be handled for each barrel of condensate during any period of the life of the field under pressure depletion is indicated. That is, initially approximately one million cubic feet of gas would be handled with each 100 barrels of stable condensate produced, while at the time when the reservoir pressure has been depleted to 2000 p.s.i. only 45 barrels of condensate will be produced with each million cubic feet of gas. In other words, the gas/oil ratio has been more than doubled due to condensation of heavier hydrocarbons within the reservoir because of pressure drop.

The same data as presented in Figures 2 and 3 are used to determine the volume of the recoverable hydrocarbons which may be expected under a cycling or pressure maintenance program.

As an example, assume 70% of the reservoir may be cycled and the average reservoir pressure drop during this period, because of the extraction of liquid products and gas used as fuel, will be 10% (400 p.s.i.) resulting in a reservoir pressure of 3400 p.s.i. From Figure 2, it is indicated that approximately 5190 barrels of normal pentane and heavier hydrocarbons per million cubic feet of pore space will be condensed or lost in the reservoir with this pressure reduction. Based on formation volume factors derived from the experiments, it is calculated 17,490

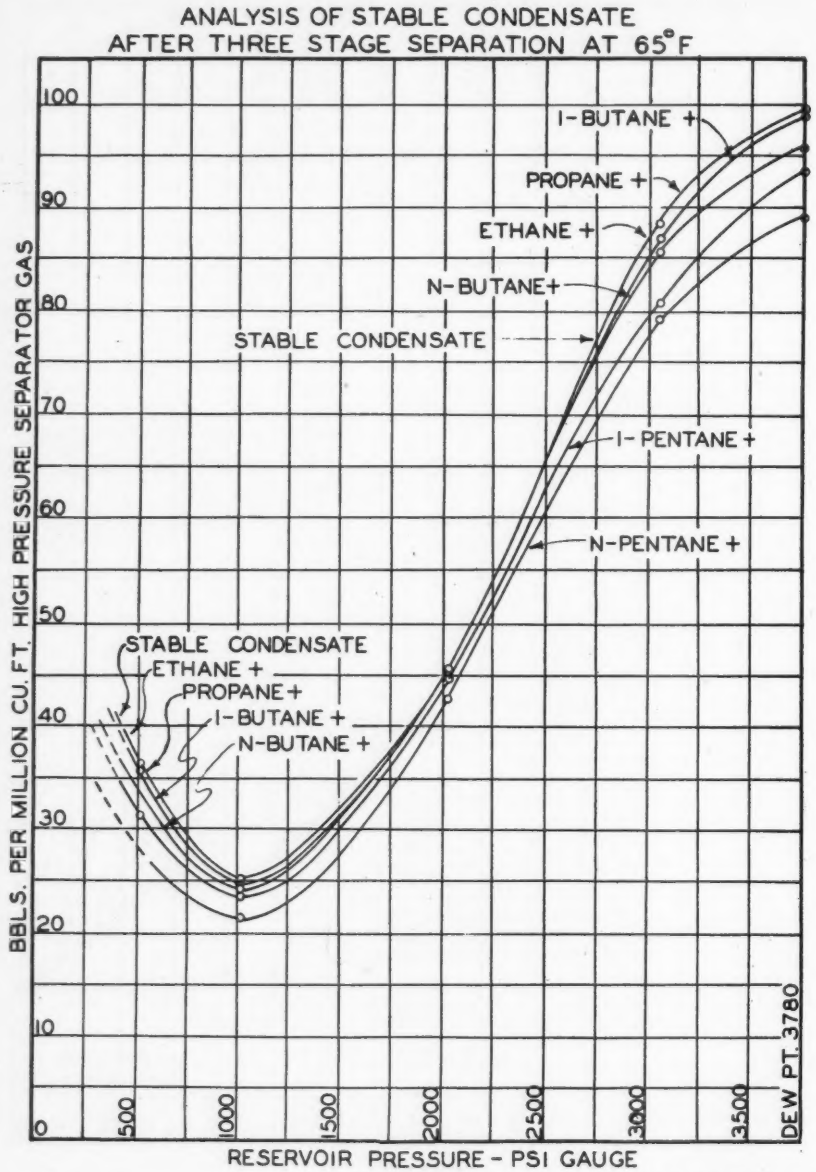



FIGURE 4

GULF REASEARCH & DEVELOPMENT CO.

barrels per million cubic feet of pore space of pentane and heavier hydrocarbons were originally in place. Deducting the 1590 barrels lost by condensation from this figure and multiplying by 70% gives a recovery of 11,130 barrels, from the 70% of the area assumed to be cycled.

In the uncycled portion of the field, which will be produced subsequent to the cycling program by pressure depletion to 500 p.s.i., Figure 3 indicates a recovery of 8600 barrels of normal pentane and heavier hydrocarbons per million cubic feet of pore space, which multiplied by 30% gives a recovery of 2580 barrels in the uncycled area. This is equal to a combined recovery from the total area of 13,710 barrels of normal pentane and heavier hydrocarbons per million cubic feet of pore space or 78.4% of the original hydrocarbons in place. As a matter of comparison under straight pressure depletion program, the recovery would have been 8600 barrels or 49.2% of the original hydrocarbons in place. Likewise, as shown in Table I, the recovery of any hydrocarbon fraction or group of fractions may be calculated.

With these data, and knowing the size of the reservoir, the economics of whether to produce a field by pressure depletion or by cycling may be determined. Certain refinements, which may be made in the calculations to assist in evaluating the respective programs, have not been discussed herein, as they were not deemed essential in explaining the use of the basic data.

*A.I.M.E. Tech. Pub. No. 1861 "Volumetric and Phase Behavior of Oil and Gas Paloma Field", by R. H. Olds, B. H. Sage, and W. N. Lacey.

**Figures 2, 3, and 4 and Table I: Gulf Research and Development Company, Pittsburgh, Pa.

## An Engineer's Viewpoint on Design of Compressor Cylinders

*(Continued from Page 17)*

the liner, piston, and rings need be changed within each range.

Every individual case must be engineered separately except where there is an addition to an existing plant or in rare cases where there is a duplication of an existing plant.

These two papers delivered at Fall Meeting, CNGA.

## Emsco Chain Handled By Petroleum Equipment Co.

The Emsco Derrick & Equipment Company announces the appointment of the Petroleum Equipment Company as exclusive distributor of Emsco Oilfield Chain in the states of California, Oregon and Washington. Petroleum Equipment Company Field Stores, strategically located to service oilfield operations on the Pacific Coast, will maintain complete stocks of the eight distinct types of Emsco chain and will employ special custom-built Emsco chain racks to display the chain to the trade. The new Display Racks, it is felt by both Emsco and the Petroleum Equipment Company, will receive marked and favorable reaction from oil-producing operators.

Petroleum Equipment Company Field Stores in California stocking Emsco Oilfield Chain are located at Avenal, Bakersfield, Saugus, Long Beach, Rio Vista, Santa Fe Springs, Santa Maria, Taft, and Ventura.

# Small Scale Catalytic Cracking

Refiners representing 42 per cent of the Nation's crude capacity possess no catalytic cracking facilities whatsoever. A high percentage of this group are refiners processing less than 10,000 barrels per day of crude oil.

A new integrally designed small TCC unit has now been developed to enable refiners in this class to meet competitive octane requirements. This paper presents process and economic studies on the application of the TCC process to the small refinery, and demonstrates its profit possibilities.

**The Application of the TCC Process in Plants of Moderate Refining Capacity**

**By H. D. Noll, Houdry Process Corporation**
**and**
**V. O. Bowles, The Lummus Company**

The petroleum refining industry is approaching an era which is in many respects unique in its history. Normally the adoption of new processes and new refinery technique must be justified strictly from the standpoint of economics and with consideration of the quality of products dictated by competitive marketing conditions. The war years, however, witnessed the installation of over one million barrels daily of potential catalytic cracking capacity under conditions where the consideration of economics was secondary to the primary purpose, which was rapid installation of plants for aviation gasoline production with the minimum expenditure of critical materials. Extensive research and development over many years was intensified during the war, prompted by the necessity for producing the maximum of aviation gasoline. This resulted in a greatly accelerated rate for commercial scale adoption of catalytic cracking developments. Refining technique in catalytic processing was advanced in a period of a little less than four years to an extent which would in all probability have required fifteen to twenty years of research and development in normal times. The developments which have been forthcoming and the improved quality of motor fuels thus made possible have stimulated automotive engineers to develop engine designs which will pass on to the public all of the advantages in performance which are made possible by reason of the higher quality gasolines which will be available.

The catalytic cracking capacity already installed in this country is equivalent to 23 per cent of the nation's refining capacity and, generally speaking, is capable of producing a volume of super quality motor fuel equivalent to 26 per cent of the nation's normal peace-time demand for all motor fuels. These estimates, however, are based upon national averages and it should be recognized that the catalytic cracking capacity required by wartime demand has been installed in 52 refineries processing about 2,700,000 barrels per day of crude and representing almost 60 per cent of the nation's refining capacity. The installation of catalytic cracking plants both as to capacity and location during the war was often determined by factors other than those which would normally apply for peace-time considerations. Thus, while the national average of installed catalytic cracking capacity is equivalent to 23 per cent of the nation's refining capacity, this catalytic capacity has actually been installed in 52 refineries, representing 58 per cent of the

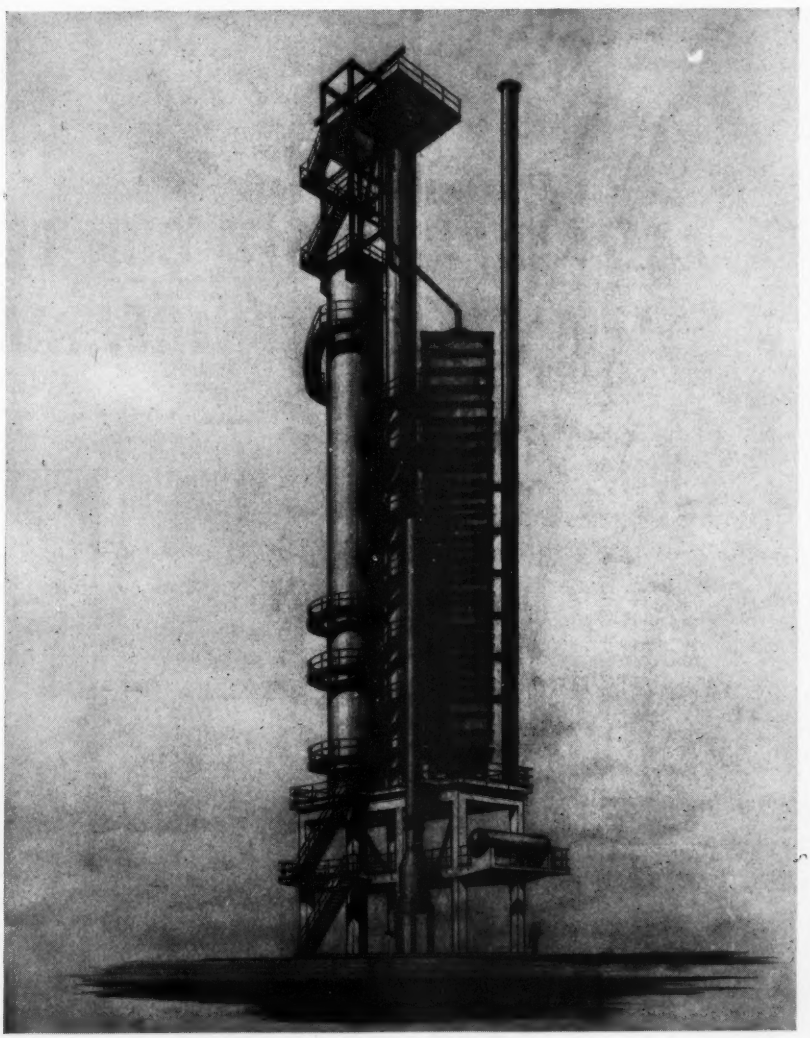
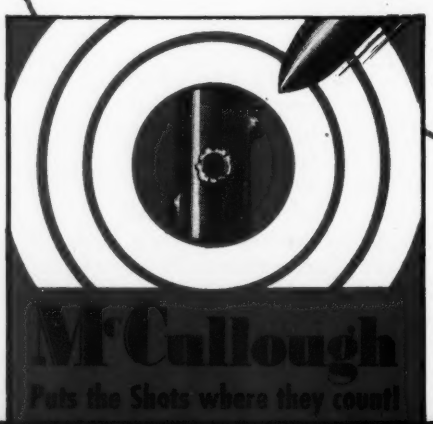


Figure 1

# ABLE, EXPERIENCED GUN PERFORATING SERVICE ANY WHERE...ANY TIME!

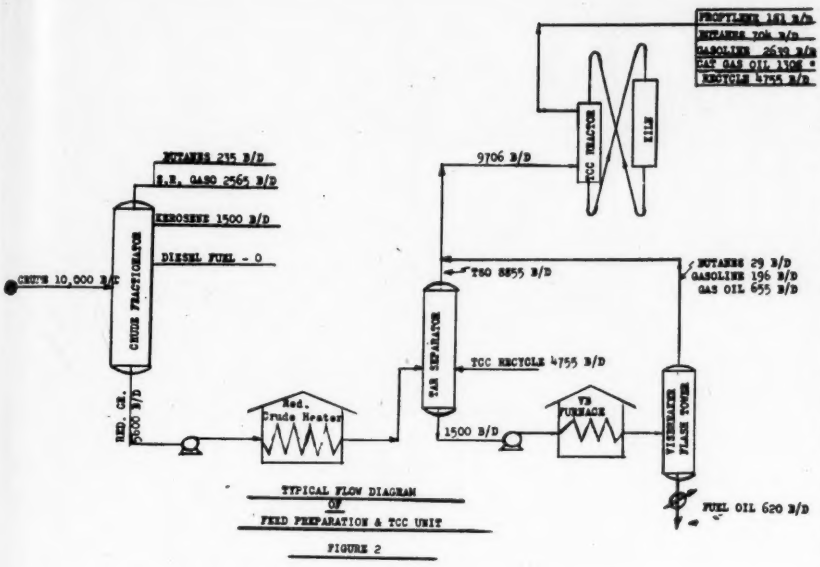
Conveniently located near every major oil field, these 21 offices are staffed with skilled McCullough field men, ready and experienced, to give you, quickly, the proved advantages of McCullough gun perforating service—greater penetration (competitive field tests prove it), accurate location in the well, and exact spacing of the shots.




## 21 SERVICE LOCATIONS

McCULLOUGH TOOL COMPANY . . . 5820 South Alameda Street, Los Angeles 11, California
Export Office: 30 Rockefeller Plaza, New York 20, N.Y.

HOUSTON, TEXAS
WICHITA FALLS, TEXAS
VICTORIA, TEXAS
CORPUS CHRISTI, TEXAS
ODESSA, TEXAS
TYLER, TEXAS
McALLEN, TEXAS
ALICE, TEXAS
NEW IBERIA, LA.
SHREVEPORT, LA.
HOUMA, LA.
LAKE CHARLES, LA.
OKLAHOMA CITY, OKLA.
GUYMON, OKLA.
LAUREL, MISSISSIPPI
CASPER, WYO.
LOS ANGELES, CALIF.
VENTURA, CALIF.
BAKERSFIELD, CALIF.
AVENAL, CALIF.
SACRAMENTO, CALIF.




TYPICAL FLOW DIAGRAM OF FEED PREPARATION & TCC UNIT

FIGURE 2

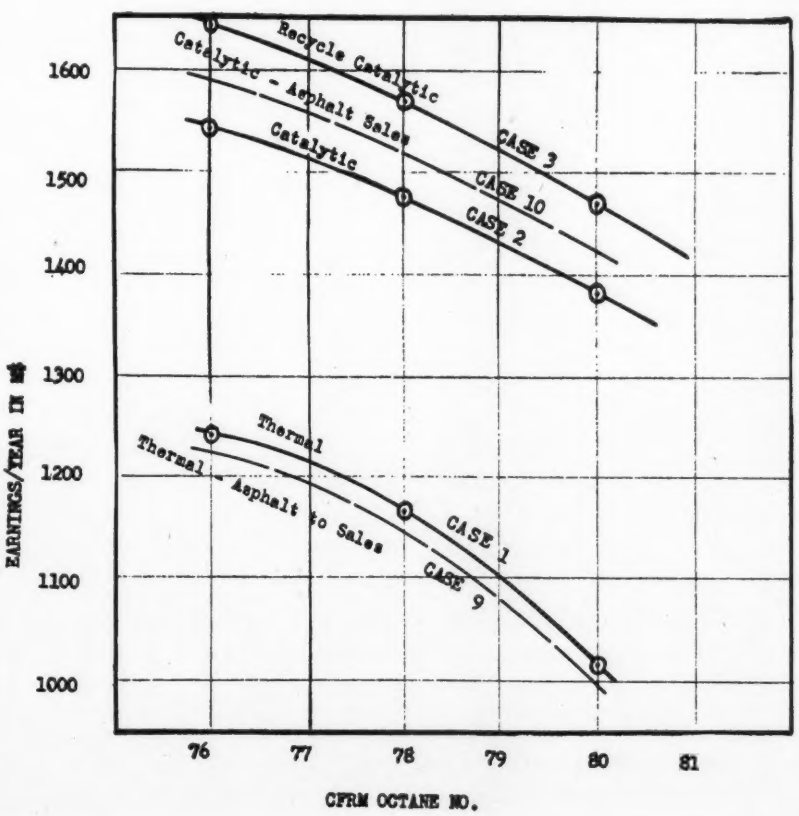
nation's refining capacity. This group of refiners has slightly over 40 per cent of catalytic cracking capacity, based upon crude runs, whereas refiners representing 42 per cent of the nation's crude capacity possess no catalytic cracking whatsoever. In the face of this situation, the outlook for the potential postwar markets indicates a motor gasoline situation which may well be more competitive than at any time in the history of the industry. Thus, those refiners equipped with adequate catalytic capacity will be able to take advantage of the improved quality motor fuel they are in a position to manufacture in order to expand further the sales of motor fuel in their marketing areas. Those who have not installed catalytic cracking facilities will be hard-put to meet competitive quality and maintain motor gasoline markets.

The problem of motor fuel quality is even more vital to the operators of small refineries who in years past have depended largely upon the gasoline market to insure continued profits. It is necessary to their sound economic position and to the strength of the petroleum industry as a whole that the operators of small refineries be able to meet the challenge of competitors by producing motor fuel of at least equal quality and at a cost which will enable them to maintain a satisfactory margin of profit. Houdry engineers for some time have been at work on the development of a small integral TCC unit which will provide the answer to this perplexing problem. The goal was to develop a unit which could process two to three thousand barrels per day of charging stock catalytically with a per barrel investment and operating cost which would be comparable to that for larger plants. The design for these small plants has been completed and the small integral TCC unit is available to the industry.

While these units embody a number of design simplifications, they are nevertheless in principle very similar to the large TCC units built for the war program. The enormous experience gained in the design and operation of the first units is of course reflected in the design and operating simplicity of this latest Houdry development. The simplifications include integral elevator design for both spent and regenerated catalyst. Further, it has been possible to eliminate vapor superheat-

FIGURE 3

EARNINGS PER YEARS VS OCTANE NO.



## TABLE I

### SUMMARY OF YEARLY EARNINGS, RETIREMENT PERIOD AND EARNINGS END OF 10 YEARS AFTER INVESTMENT RETIREMENT

| CASE NO. | 1 | 2(C) | 3 | 4 | 9 | 10 |
|---|---|---|---|---|---|---|
| OCTANE NO. | 76 | 76 | 76 | 76 | | |
| TYPE OF PROCESS* (1C) | D, Th, VB | D, VB, TCC, Th. | D, VB, RTCC, Th. | D, VB, RTCC | | |
| INVESTMENT | $1,400,000 | $2,755,000 | $2,905,000 | $2,510,000 | | |
| EARNINGS/YR. | 1,239,000 | 1,547,000 | 1,641,000 | 1,632,000 | | |
| PAYOUT, YRS. | 1.13 | 1.78 | 1.77 | 1.54 | | |
| EARNINGS END 10 YRS. | 10,990,000 | 12,715,000 | 13,505,000 | 13,810,000 | | |
| cc's T.E.L./Gal. | 2.10 | 0.85 | 0.75 | 0.75 | | |
| OCTANE NO. | 78 | 78 | 78 | 78 | | |
| TYPE OF PROCESS* (1B) | D, LR, Th, VB | D, VB, TCC, Th. | D, VB, RTCC, Th. | D, VB, RTCC | | |
| INVESTMENT | $1,550,000 | $2,755,000 | $2,905,000 | $2,510,000 | | |
| EARNINGS/YR. | 1,164,000 | 1,475,000 | 1,567,000 | 1,564,000 | | |
| PAYOUT, YRS. | 1.33 | 1.87 | 1.85 | 1.60 | | |
| EARNINGS END 10 YRS. | 10,090,000 | 11,995,000 | 12,765,000 | 13,130,000 | | |
| cc's T.E.L./Gal. | 1.60 | 1.30 | 1.20 | 1.20 | | |
| OCTANE NO. | 80 | 80 | 80 | 80 | 80 | 80 |
| TYPE OF PROCESS* (1A) | D, ER, Th, VB | D, VB, TCC, Th. | D, VB, RTCC, Th. | D, VB, RTCC | D, A, ER, Th. | D, A, TCC, Th. |
| INVESTMENT | $1,640,000 | $2,755,000 | $2,905,000 | $2,510,000 | $1,745,000 | $2,945,000 |
| EARNINGS/YR. | 1,015,000 | 1,380,000 | 1,469,000 | 1,480,000 | 993,000 | 1,424,000 |
| PAYOUT, YRS. | 1.62 | 2.00 | 1.98 | 1.70 | 1.76 | 2.07 |
| EARNINGS, END 10 YRS. | 8,510,000 | 11,045,000 | 11,785,000 | 12,290,000 | 8,185,000 | 11,295,000 |
| cc's T.E.L./Gal. | 2.00 | 1.90 | 1.80 | 1.75 | 2.00 | 2.00 |
| OCTANE NO. | 82 | 82 | 82 | 82 | 82 | 82 |
| TYPE OF PROCESS* (1A) | D, ER, Th, VB | D, VB, TCC, Th. | D, VB, RTCC, Th. | D, VB, RTCC, | D, A, ER, Th. | D, A, TCC, Th. |
| INVESTMENT | $1,640,000 | $2,755,000 | $2,905,000 | $2,510,000 | $1,745,000 | $2,945,000 |
| EARNINGS/YR. | 898,000 | 1,246,000 | 1,338,000 | 1,365,000 | 857,000 | 1,282,000 |
| PAYOUT, YRS. | 1.83 | 2.21 | 2.17 | 1.84 | 2.04 | 2.30 |
| EARNINGS END 10 YRS. | 7,340,000 | 9,705,000 | 10,475,000 | 11,180,000 | 6,825,000 | 9,675,000 |
| cc's T.E.L./Gal. | 2.90 | 2.75 | 2.60 | 2.50 | 3.05 | 2.90 |

* CODE - D - Diesel Fuel to Sales
ER - Reforming 1600 B.P.C.D.
LR - Reforming 1050 B.P.C.D.
TCC - Once Through TCC Cracking
RTCC - 1:1 Recycle TCC Cracking
Th - Thermal Cracking Virgin or TCC Gas Oils
VB - Vis Breaking Tar Separator Bottoms or other reduced crude
A - Asphalt to Sales
(1A) (1B) (1C) refer to subcases under Case 1.

# A 105 YEAR REPUTATION for QUALITY and SERVICE

says *"You're Right"* when you specify

# SPANG Tubular Products

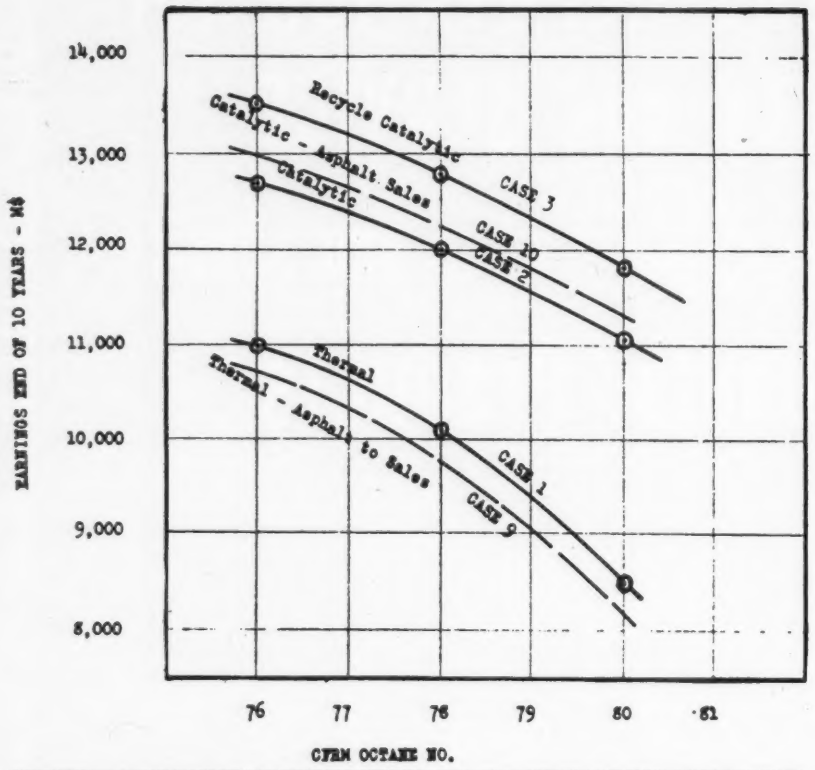
## SPANG-CHALFANT

Division of The National Supply Co.
Executive Offices: Pittsburgh, Pa.

District Sales Offices: Atlanta; Boston; Chicago; Denver; Detroit; Houston; Los Angeles; New York; Philadelphia; Pittsburgh; St. Louis; San Francisco; Tulsa; Washington.

FIGURE 4

EARNINGS END OF 10 YEARS AFTER INVESTMENT RETIREMENT VS OCTANE NO.




ers through increase in catalyst rates. In addition, since the small units are of more compact design, it has been possible to reduce the overall height and simplify the structure substantially. Simplifications in this design result in savings in both operating and maintenance cost, and make it possible for refiners with small staffs to service units with their normal maintenance crews. The TCC kiln and reactor section of the small unit require a space of about 40 ft. by 30 ft., making conversion of existing thermal crackers into catalytic units a very practical consideration. Figure 1 in the paper shows an isometric sketch of the reactor kiln section of this type of TCC unit.

Heretofore, most methods of refinery octane improvement have depended upon a sacrifice in gasoline output in order to improve quality. Catalytic cracking stands alone as a major refining tool with which high quality motor fuel may be obtained without sacrifice in ultimate output. In fact, catalytic cracking increases the overall yield of gasoline from a barrel of crude and reduces the yield of residual fuel oil. In this sense, it can be said that catalytic cracking in effect converts refinery residual fuel oil into motor gasoline and at the same time improves the octane number of motor fuel by a substantial margin.

The value of catalytic cracking to a refiner will, of course, depend upon a number of considerations. Perhaps the most vital of these are two:

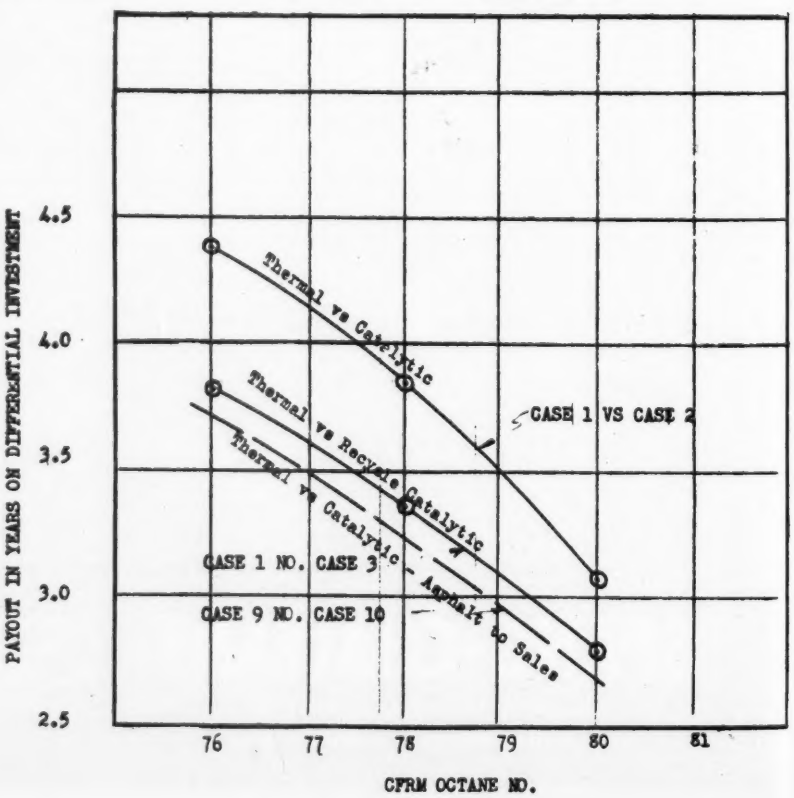
1. The relation of refinery gasoline price to residual fuel price.
2. The octane level required of housebrand and premium fuels.

While only a thorough analysis of this individual situation will give the refiner his final answer, a general study will usually indicate trends.

With this in mind, an attempt has been made to present herewith a general study of the economics of

FIGURE 5

DIFFERENTIAL RETIREMENT PERIODS VS OCTANE NO.



## TABLE 2

### SUMMARY OF ECONOMICS
(Diesel Fuel to Sales)

| CASE NO. | | 1A | | 1B | | 1C | | 2A | | 2B | | 2C | | 3 | | 4 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| REVENUE | ¢/Gal. | B/CD | $/Day | B/CD | $/Day | B/CD | $/Day | B/CD | $/Day | B/CD | $/Day | B/CD | $/Day | B/CD | $/Day | B/CD | $/Day |
| 10# R.V.P. Motor Gasoline | 6.250(1) | 4,740 | 12,443 | 4,843 | 12,713 | 4,975 | 13,059 | 5,346 | 14,033 | 5,491 | 14,414 | 5,722 | 15,020 | 5,941 | 15,595 | 5,516 | 14,480 |
| Kerosene | 4.250 | 1,500 | 2,678 | 1,500 | 2,678 | 1,500 | 2,678 | 1,500 | 2,678 | 1,500 | 2,678 | 1,500 | 2,678 | 1,500 | 2,678 | 1,500 | 2,678 |
| Diesel Fuel | 3.625 | 1,100 | 1,675 | 1,100 | 1,675 | 1,100 | 1,675 | 1,100 | 1,675 | 1,100 | 1,675 | 1,100 | 1,675 | 1,100 | 1,675 | 1,100 | 1,675 |
| #2 Fuel | 3.625 | - | - | - | - | - | - | - | - | | | | | | | 656 | 1,002 |
| Residual Fuel | 2.145 | 2,067 | 1,860 | 2,045 | 1,841 | 2,003 | 1,803 | 1,391 | 1,252 | 1,369 | 1,232 | 1,327 | 1,194 | 1,078 | 970 | 949 | 854 |
| Dry Gas (F.O.E.) | 2.145 | 698 | 628 | 636 | 572 | 522 | 470 | 685 | 617 | 623 | 561 | 509 | 458 | 478 | 430 | 329 | 296 |
| Excess Butane | 1.450 | 20 | 12 | - | - | - | - | 132 | 81 | 74 | 45 | - | - | 70 | 43 | 74 | 45 |
| TOTAL REVENUE | | | 19,296 | | 19,479 | | 19,685 | | 20,336 | | 20,605 | | 21,025 | | 21,391 | | 21,030 |
| OPERATING COSTS | | | | | | | | | | | | | | | | | |
| Crude | 3.33 | 10,000 | 14,000 | 10,000 | 14,000 | 10,000 | 14,000 | 10,000 | 14,000 | 10,000 | 14,000 | 10,000 | 14,000 | 10,000 | 14,000 | 10,000 | 14,000 |
| Crude Distillation | | 10,000 | 420 | 10,000 | 420 | 10,000 | 420 | 10,000 | 420 | 10,000 | 420 | 10,000 | 420 | 10,000(2) | 420 | 10,000 | 420 |
| TCC Cracking | | - | - | - | - | - | - | 3,650 | 540 | 3,650 | 540 | 3,650 | 540 | 7,310(2) | 710 | 7,310(2) | 710 |
| TCC Gas Plant | | | | | | | | | 212 | | 212 | | 212 | | 223 | | 223 |
| Thermal Cracking (3) | | 6,100 | 751 | 5,540 | 706 | 4,500 | 585 | 4,782 | 586 | 4,222 | 539 | 3,182 | 378 | 2,487 | 314 | 1,500 | 107 |
| Debutanization (4) | | | 18 | | 16 | | 11 | | 34 | | 31 | | 26 | | 34 | | 30 |
| Catalytic Poly. | | 180 | 157 | 153 | 147 | 106 | 130 | 310 | 204 | 287 | 196 | 239 | 179 | 259 | 186 | 229 | 175 |
| Gasoline Inhibitor | | 4,740 | 5 | 4,843 | 5 | 4,975 | 5 | 5,346 | 5 | 5,491 | 5 | 5,722 | 6 | 5,941 | 6 | 5,516 | 6 |
| Taxes, Int., Ins. | | | 225 | | 212 | | 192 | | 410 | | 397 | | 377 | | 398 | | 344 |
| T.C.C. Royalty | | | - | - | - | | - | 3,650 | 183 | 3,650 | 183 | 3,650 | 183 | 3,655 | 183 | 3,695 | 183 |
| Thermal Royalty | | 6,100 | 183 | 5,540 | 166 | 4,500 | 135 | 3,282 | 98 | 2,722 | 82 | 1,682 | 50 | 987 | 30 | - | - |
| Cat. Poly. Royalty | | 180 | 38 | 153 | 32 | 106 | 22 | 310 | 65 | 287 | 60 | 239 | 50 | 259 | 54 | 229 | 46 |
| T.E.L. TO 76 C.F.R.M. (Mac's) | | 149 | 269 | 223 | 402 | 439 | 790 | 29 | 53 | 69 | 125 | 204 | 367 | 187 | 337 | 174 | 313 |
| Total Operating Costs | | | 16,066 | | 16,106 | | 16,290 | | 16,810 | | 16,790 | | 16,788 | | 16,895 | | 16,559 |
| Earning $/Day | | | 3,230 | | 3,373 | | 3,395 | | 3,526 | | 3,815 | | 4,237 | | 4,496 | | 4,471 |
| T.E.L. To 78 C.F.R.M. (Mac's) | | 239 | 430 | 325 | 586 | 606 | 1,091 | 79 | 141 | 150 | 270 | 312 | 562 | 299 | 539 | 278 | 500 |
| Earnings $/Day | | | 3,069 | | 3,189 | | 3,094 | | 3,438 | | 3,670 | | 4,042 | | 4,294 | | 4,284 |
| T.E.L. To 80 C.F.R.M.(Mac's) | | 398 | 717 | 488 | 879 | 794 | 1,429 | 164 | 295 | 265 | 477 | 457 | 823 | 449 | 808 | 405 | 730 |
| Earnings $/Day | | | 2,782 | | 2,896 | | 2,756 | | 3,284 | | 3,463 | | 3,761 | | 4,025 | | 4,054 |
| T.E.L. To 82 C.F.R.M (Mac's) | | 577 | 1,039 | 712 | 1,281 | 1,107 | 1,993 | 292 | 525 | 415 | 747 | 661 | 1,190 | 649 | 1,168 | 598 | 1,043 |
| Earnings $/Day | | | 2,460 | | 2,494 | | 2,192 | | 3,054 | | 3,193 | | 3,414 | | 3,665 | | 3,741 |
| INVESTMENTS (PROCESS EQUIPMENT ONLY) | | | | | | | | | | | | | | | | | |
| Crude Distillation | | | $350,000 | | $350,000 | | $350,000 | | $350,000 | | $350,000 | | $350,000 | | $350,000 | | $350,000 |
| T.C.C. Catalytic Section | | | - | | - | | - | | 650,000 | | 650,000 | | 650,000 | | 725,000 | | 725,000 |
| T.C.C. Fractionation Section | | | - | | - | | - | | 475,000 | | 475,000 | | 475,000 | | 575,000 | | 575,000 |
| T.C.C. Gas Plant | | | - | | - | | - | | 470,000 | | 470,000 | | 470,000 | | 520,000 | | 520,000 |
| Thermal Cracking Gas Plant | | | 1,080,000 | | 1,010,000 | | 890,000 | | 760,000 | | 685,000 | | 565,000 | | 480,000 | | 100,000 |
| Catalytic Polymerization | | | 210,000 | | 190,000 | | 160,000 | | 285,000 | | 270,000 | | 245,000 | | 255,000 | | 240,000 |
| Total | | | $1,640,000 | | $1,550,000 | | $1,400,000 | | $2,990,000 | | $2,900,000 | | $2,755,000 | | $2,905,000 | | $2,510,000 |

(1)-Based on 75% Non-ebrand + 25% Premium Fuel. (2)-Total Feed- 1:1 Recycle. (3)-Total for Thermal Cracking and Gas Plant. (4) Utilities only.

# ★ ★ GOVERNMENT-OWNED ★ ★

# SURPLUS *For Sale*

## BY R. F. C.

## PETROLEUM INDUSTRY

## REFINING AND DRILLING EQUIPMENT

### *Refining Equipment*

1. Two unused crude oil refining units each consisting of the following:

   a. Distillation unit, comprising foundation and other structural materials, heaters with burners and stacks, heat exchangers, fractionating tower, gas oil strippers, naphtha stripper, stabilizer, cooling box, pumps, instruments and piping, steam and electrical power facilities, including buildings, fireproofing and insulating materials and other appurtenances for distillation operation. Design minimum capacity 4600 barrels paraffin type crude charge per day.

   b. Crude fuel flash unit; design capacity 11,000 barrels heavy asphaltic type crude charge per day.

   c. Naphtha reformer unit; design capacity 1,600 barrels naphtha charge per day.

2. 34 unused welded steel tanks, design capacities 1,500 to 10,000 barrels.

3. Unused utilities for above units; transfer piping, blending and leading equipment.

4. Two unused control laboratories suitable for operation of above refining units.

5. Miscellaneous unused construction tools, including welding equipment, for erection of above units.

6. Unused machine shop and pipe shop complete with power plant and buildings.

7. Unused drum plant, comprising manufacturing, cleaning and filling facilities for design capacity of 200 each 55 gal. 18 gauge steel drums per hour.

8. Unused oilfield warehouse stock suitable for operation of above units.

### *Drilling and Production Equipment*

1. One used National Ideal No. 125 special drilling rig with spare parts complete less derrick.

2. Spare parts and replacements for six National Ideal No. 50 drilling rigs.

*Detailed lists of above equipment available through Reconstruction Finance Corporation, Surplus Property Division, 306 Pacific Mutual Building, Los Angeles 14, California, 'phone MIchigan 6321, where arrangements for inspection may be made. All equipment located in Los Angeles area.*

***Sealed Bids and Public Opening***

***November 30, 1945, 10 A.M.***

# RECONSTRUCTION FINANCE CORPORATION

***Surplus Property Administration***

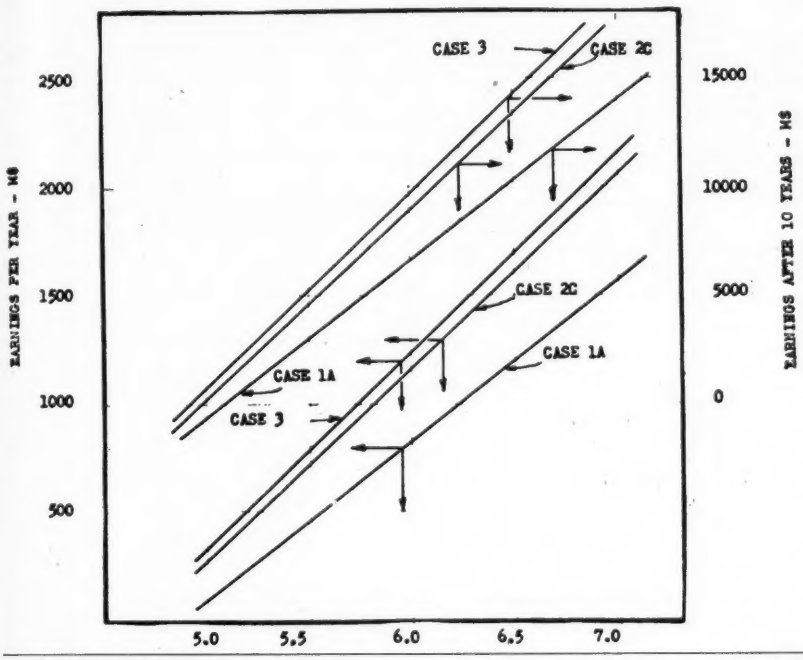
TELEPHONE MICHIGAN 6321 • EXTENSION 68

## ★ 523 WEST 6TH STREET • LOS ANGELES 14, CALIFORNIA ★

FIGURE 6

Yearly Earnings and 10 Yr. Cash Position

VS Gasoline Price




catalytic cracking for a refiner processing 10,000 BPD of crude oil. There is included within this paper a detailed analysis of all of the cases studied together with the basic assumptions employed to permit application of the general conclusions of this study to a particular problem.

The following basic cases have been considered:

1. Two-coil thermal cracking with varying depth of reforming and catalytic polymerization.
2. Visbreaking, once-through catalytic cracking, thermal cracking of the TCC cycle stock, and catalytic polymerization, including varying depths of reforming.
3. Visbreaking, recycle catalytic cracking, thermal cracking of the cycle stock and catalytic polymerization. Reforming was not employed.
4. Visbreaking, recycle catalytic cracking, and catalytic polymerization. Thermal cracking was not required as the light catalytic cycle stock was used as No. 2 fuel oil and the heavy catalytic cycle stock in No. 6 fuel blends.

These four cases have been based upon the assumption that 1500 barrels per calendar day of kerosene and 1100 barrels per calendar day of diesel fuel would be marketed as virgin stocks from the crude. A parallel series of cases (5 to 8) has been developed on the basis of cracking the virgin diesel fuel.

In addition, two cases (9 and 10) have been developed on the basis of producing asphalt for sales in order to ascertain the economic aspects of catalytic versus thermal cracking for this type of operation.

The price structure and utility values assumed are presented in the following table:

| Stock | Price |
|---|---|
| Mid-Continent Crude | $1.40/Bbl. |
| Housebrand Motor Gasoline | 6.25¢/Gal. |
| Kerosene | 4.25¢/Gal. |
| Diesel Fuel | 3.625¢/Gal. |
| No. 2 Fuel | 3.625¢/Gal. |
| No. 6 Fuel | $0.90/Bbl. |

FIGURE 7

GASOLINE YIELD VS BASE OCTANE AND TEL TO 80 CFRM

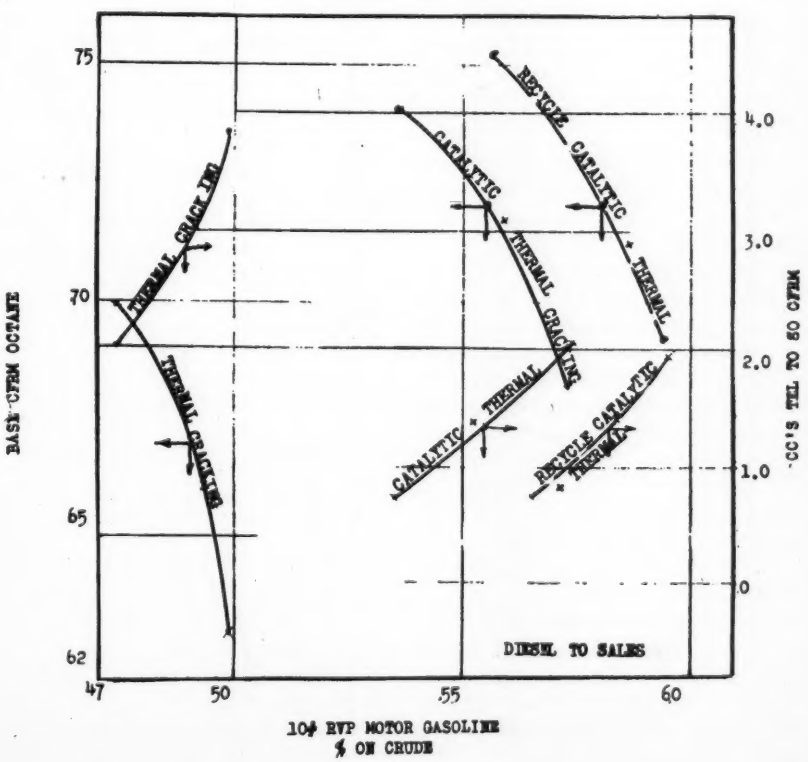
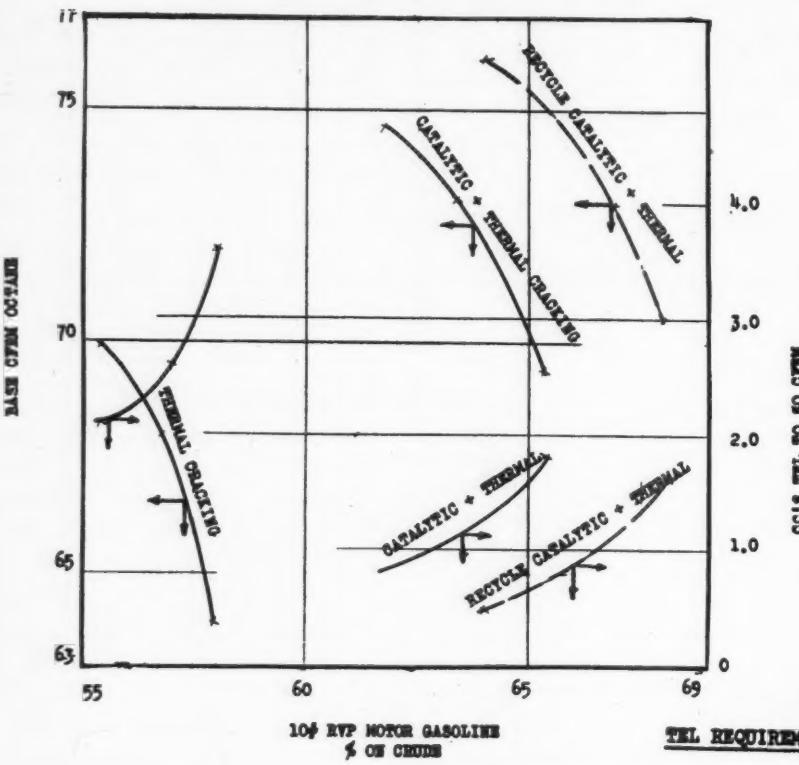


FIGURE 8

GASOLINE YIELD VS BASE OCTANE AND TEL TO 80 CFRM

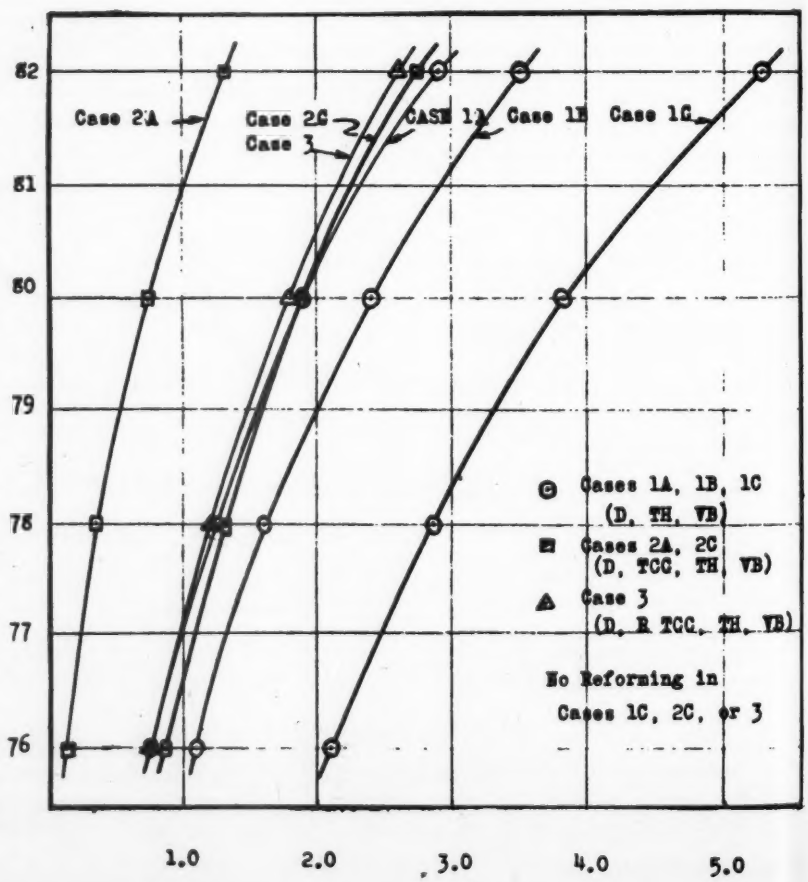



numbers with lead requirements for various octane levels of the motor gasoline are shown in Tables 5, 6 and 7. The gasoline price of 6.25 cents per gallon was arrived at on the basis of 75 per cent of housebrand gasoline at 6 cents and 25 per cent of premium fuel at 7 cents per gallon. At the 80 octane level, this would mean that housebrand fuel would have a 78 and the premium fuel an 85 octane number.

In every case except where asphalt is produced, it has been assumed that the reduced crude would be visbroken in order to minimize residual fuel. In these cases with catalytic cracking, the total vaporizable effluent from the viscosity breaking operation flows directly to the catalytic cracking unit as is illustrated in the typical flow diagram, Figure 2. There are, of course, other processing methods (such as propane deasphalting or vacuum flashing) which can be employed in order to charge a heavier stock to

FIGURE 9

TEL REQUIREMENTS VS OCTANE NUMBERS




Butanes .....1.45¢/Gal.
Fuel Gas .....$0.15/MM Btu.
Steam .....$0.24/M Lbs.
Power .....0.7¢/KWH
Water (Cooling) .....0.5¢/M Gal.
Water (Treated) .....$0.15/M Gal.
Clay Catalyst .....$0.04/Lb.

The above prices are, of necessity, arbitrarily chosen. For an individual refiner to obtain a true picture, it is recommended that he substitute his own price structure.

The maintenance on topping units and gas plant was set at 3% of the investment, whereas for catalytic cracking, thermal cracking and catalytic polymerization a rate of 4% was established. The taxes, interest and insurance were set at 5.0% of the investment. Estimated royalty rates were used for catalytic and thermal cracking and catalytic polymerization processes and are shown in the detailed tables.

The basic yields used for the various processes are shown in Tables 8, 9 and 10. Overall commodity balances, capacities of the various processing units, and clear octane

TABLE 3—SUMMARY OF ECONOMICS (Diesel Fuel to Cracking)

| CASE NO. | | 5A | | 5B | | 5C | | 6A | | 6B | | 7 | | 8 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| INCOME | ¢/Gal. | $/Cu | $/Day | $/Cu | $/Day | $/Cu | $/Day | $/Cu | $/Day | $/Cu | $/Day | $/Cu | $/Day | $/Cu | $/Day |
| 10# R.V.P. Motor Gasoline | 6.250(1) | 5,529 | 14,514 | 5,638 | 14,800 | 5,804 | 15,236 | 6,168 | 16,191 | 6,309 | 16,561 | 6,541 | 17,170 | 6,796 | 17,840 |
| Kerosene | 4.250 | 1,500 | 2,678 | 1,500 | 2,678 | 1,500 | 2,678 | 1,500 | 2,678 | 1,500 | 2,678 | 1,500 | 2,678 | 1,500 | 2,678 |
| #2 Fuel | 3.625 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Residual Fuel | 2.145 | 2,264 | 2,038 | 2,242 | 2,018 | 2,200 | 1,980 | 1611 | 1,450 | 1,589 | 1,430 | 1,547 | 1,392 | 1,228 | 1,105 |
| By Gas (F.O.E.) | 2.145 | 888 | 799 | 825 | 743 | 721 | 640 | 826 | 743 | 764 | 688 | 650 | 585 | 552 | 497 |
| Excess Butane | 1.490 | 21 | 31 | - | - | - | - | 115 | 70 | 70 | 43 | - | - | 100 | 61 |
| Total Revenue | | | 20,042 | | 20,239 | | 20,534 | | 21,132 | | 21,400 | | 21,825 | | 22,181 |
| OPERATING COSTS | | | | | | | | | | | | | | | |
| Crude | 3.33 | 10,000 | 14,000 | 10,000 | 14,000 | 10,000 | 14,000 | 10,000 | 14,000 | 10,000 | 14,000 | 10,000 | 14,000 | 10,000 | 14,000 |
| Crude Distillation | | 10,000 | 420 | 10,000 | 420 | 10,000 | 420 | 10,000 | 420 | 10,000 | 420 | 10,000(2) | 420 | 10,000 | 420 |
| F.C.C. Cracking | | | | | | 4,755 | 627 | 4,755 | 627 | 4,755 | 627 | 9,510(2) | 858 | 9,510(2) | 858 |
| F.C.C. Gas Plant | | | - | | - | | 235 | | 235 | | 235 | | 247 | | 247 |
| Thermal Cracking (3) | | 7,200 | 859 | 6,640 | 813 | 5,600 | 693 | 8,307 | 651 | 4,747 | 587 | 3,707 | 458 | 2,808 | 344 |
| Dehydrogenation (4) | | | 23 | | 21 | | 17 | | 41 | | 39 | | 35 | | 43 |
| Catalytic Poly. | | 229 | 175 | 204 | 166 | 69 | 115 | 378 | 228 | 362 | 222 | 313 | 185 | 231 | 211 |
| Gasoline Inhibitor | | 5,529 | 6 | 5,638 | 6 | 5,804 | 6 | 6,168 | 6 | 6,309 | 6 | 6,541 | 7 | 6,796 | 7 |
| Base, Int., Ins. | | | 252 | | 240 | | 210 | | 450 | | 441 | | 422 | | 465 |
| F.C.C. Royalty | | | | | | | | 4,755 | 238 | 4,755 | 238 | 4,755 | 238 | 4,755 | 238 |
| Thermal Royalty | | 7,200 | 216 | 6,640 | 199 | 5,600 | 168 | 3,607 | 114 | 3,247 | 97 | 2,207 | 66 | 1,306 | 39 |
| Cat. Poly. Royalty | | 229 | 46 | 204 | 41 | 69 | 15 | 378 | 80 | 362 | 76 | 313 | 66 | 331 | 70 |
| T.E.L. To 76 C.F.R.M. (Mcc's) | | 197 | 395 | 295 | 405 | 475 | 476 | 39 | 70 | 53 | 95 | 206 | 171 | 171 | 108 |
| Total Operating Costs | | | 16,334 | | 16,313 | | 16,500 | | 17,140 | | 17,065 | | 17,100 | | 17,260 |
| Earnings $/Day | | | 3,688 | | 3,926 | | 4,034 | | 3,992 | | 4,335 | | 4,725 | | 4,921 |
| T.E.L. To 78 C.F.R.M. (Mcc's) | | 333 | 664 | 355 | 679 | 658 | 1,185 | 104 | 186 | 133 | 239 | 330 | 594 | 294 | 529 |
| Earnings $/Day | | | 3,479 | | 3,692 | | 3,765 | | 3,876 | | 4,173 | | 4,700 | | 4,726 |
| T.E.L. To 80 C.F.R.M. (Mcc's) | | 468 | 878 | 533 | 999 | 878 | 1,580 | 207 | 373 | 292 | 453 | 495 | 890 | 457 | 822 | 406 | 731 |
| Earnings $/Day | | | 3,165 | | 3,372 | | 3,310 | | 3,689 | | 3,959 | | 4,206 | | 4,407 | | 4,476 |
| T.E.L. To 82 C.F.R.M. (Mcc's) | | 720 | 1,296 | 781 | 1,407 | 1,219 | 2,194 | 389 | 699 | 434 | 783 | 742 | 1,335 | 671 | 1,207 | 590 | 1,061 |
| Earning $/Day | | | 2,747 | | 2,984 | | 2,996 | | 3,383 | | 3,649 | | 3,761 | | 4,022 | | 4,146 |
| INVESTMENTS (PROCESS EQUIPMENT ONLY) | | | | | | | | | | | | | | | |
| Crude Distillation | | | $350,000 | | $350,000 | | $350,000 | | $350,000 | | $350,000 | | $350,000 | | $350,000 |
| F.C.C. Catalytic Section | | | - | | - | | - | | 725,000 | | 725,000 | | 725,000 | | 900,000 |
| F.C.C. Fractionation Section | | | - | | - | | - | | 575,000 | | 575,000 | | 575,000 | | 700,000 |
| F.C.C. Gas Plant Section | | | - | | - | | - | | 520,000 | | 520,000 | | 520,000 | | 630,000 |
| Thermal Cracking + Gas Plant | | 1,250,000 | | 1,175,000 | | 1,000,000 | | 800,000 | | 740,000 | | 825,000 | | 520,000 | | 100,000 | |
| Catalytic Polymerization | | 240,000 | | 225,000 | | 125,000 | | 320,000 | | 310,000 | | 285,000 | | 295,000 | | 275,000 | |
| Total | | $1,840,000 | | $1,750,000 | | $1,475,000 | | $3,290,000 | | $3,220,000 | | $3,080,000 | | $3,395,000 | | $2,955,000 |

(1)-Based on 75% Houdriflow + 25% Premium Fuel. (2)-Total Feed - 1:1 Recycle. (3)-Total For Thermal Cracking and Gas Plants. (4)-Utilities Only.

the catalytic plant. While the flexibility of TCC units is such that these heavy charging stocks can be readily handled, the aforementioned methods of processing (vacuum flashing and propane deasphalting) were not considered in the economic studies presented herein except in those cases involving the manufacture of asphalt since it is believed that expensive means of charge stock preparation cannot be justified unless outlets for specialty products such as asphalt are available. The gasoline yield advantage generally obtained through processing reduced crude to pitch by distillation or deasphalting is virtually eliminated if it becomes necessary to blend the pitch back to marketable fuel oil.

A summary of economics, showing yearly earnings, retirement periods, and earnings at the end of 10 years during which period the investment has been retired, is presented in Table 1. Cases 1, 2, 3, 4, 9 and 10, all involving the production of diesel fuel for sales, have been considered in this series of cases for economic comparisons and while a series of cases parallel to 1, 2, 3 and 4, shown in Table 1, has been developed on the basis of cracking the diesel fuel, these cases have not been summarized as in Table 1 since the same general conclusions are reached. Complete details showing the development of the economics for all of these cases are presented in Tables 2, 3 and 4. In cases 1 and 2 (also cases 5 and 6) shown in Tables 2 and 3, involving all thermal cracking and once-through catalytic cracking, respectively, the effect is shown of varying the depth of reforming from zero, as indicated in Case 1C, to a maximum of 1600 BPGD, as indicated in Case 1A, with Case 1B as an intermediate.

For each case studied, a depth of reforming was selected for comparison which resulted in maximum dollar return, provided a lead limit of 2 cc per gallon was not exceeded. This limit was imposed because of the generally poor road performance shown with highly leaded fuels; and because of the desirability from the standpoint of flexibility in refining operations of reaching a given mo-

## TABLE 4

## SUMMARY OF ECONOMICS
(Diesel Fuel to Sales)

| CASE NO: | | 9 | | 10 | |
|---|---|---|---|---|---|
| **Revenue** | **¢/Gal.** | **B/CD** | **$/Day** | **B/CD** | **$/Day** |
| 10# RVP Motor Gasoline | 6.250 (1) | 4,710 | 12,364 | 5,708 | 14,984 |
| Kerosene | 4.250 | 1,500 | 2,678 | 1,500 | 2,678 |
| Diesel Fuel | 3.625 | 1,100 | 1,675 | 1,100 | 1,675 |
| Residual Fuel | 2.145 | 1,429 | 1,286 | 755 | 680 |
| Asphalt | 3.750 | 600 | 945 | 600 | 945 |
| Dry Gas (F.O.B. | 2.145 | 670 | 603 | 445 | 400 |
| Excess Butane | 1.450 | 36 | 22 | - | - |
| Total Revenue | | | 19,303 | | 21,362 |
| **Operating Costs** | | | | | |
| Crude | | 10,000 | 14,000 | 10,000 | 14,000 |
| Crude Distillation | | 10,000 | 420 | 10,000 | 420 |
| Vacuum Reduction | | 3,000 | 150 | 1,500 | 118 |
| TCC Cracking | | - | - | 3,900 | 565 |
| TCC Gas Plant | | - | - | - | 217 |
| Thermal Cracking (3) | | 5,500 | 675 | 1,799 | 355 |
| Debutanization (4) | | - | 18 | - | 34 |
| Catalytic Poly. | | 188 | 159 | 244 | 181 |
| Gasoline Inhibitor | | 4,710 | 5 | 5,708 | 6 |
| Taxes, Int., Ins. | | - | 239 | - | 403 |
| TCC Royalty | | - | - | - | 195 |
| Thermal Royalty | | - | 165 | - | 54 |
| Cat. Poly. Royalty | | 188 | 39 | 244 | 51 |
| TEL to 76 CFRM (M cc's) | | 158 | 284 | 216 | 389 |
| Total Operating Costs | | | 16,154 | | 16,988 |
| Earnings, $/Day | | | 3,149 | | 4,374 |
| TEL to 78 CFRM (M cc's) | | 267 | 481 | 324 | 583 |
| Earnings, $/Day | | | 2,952 | | 4,180 |
| TEL to 80 CFRM (M cc's) | | 396 | 713 | 479 | 862 |
| Earnings, $/Day | | | 2,720 | | 3,901 |
| TEL to 82 CFRM (M cc's) | | 603 | 1,085 | 695 | 1,251 |
| Earnings, $/Day | | | 2,348 | | 3,512 |
| **Investments (Process Equipment Only)** | | | | | |
| Crude Distillation | | | $ 350,000 | | $ 350,000 |
| Vacuum Reduction | | | 330,000 | | 240,000 |
| TCC Catalytic Section | | | - | | 1,175,000 |
| TCC Fractionation Section | | | - | | - |
| TCC Gas Plant | | | - | | 490,000 |
| Thermal Cracking and Gas Plant | | | 855,000 | | 440,000 |
| Catalytic Polymerization | | | 210,000 | | 250,000 |
| Total | | | $1,745,000 | | $2,945,000 |

(1) Based on 75% Housebrand and 25% Premium Fuel
(3) Total for Thermal Cracking and Gas Plant
(4) Utilities Only

TABLE 5

SUMMARY OF YIELDS AND PROCESS EQUIPMENT
(Diesel To Sales)

| TYPE OPERATION | THERMAL CRACKING VARIABLE THERMAL REFORMING | | | CATALYTIC CRACKING + VIS BREAKING THERMAL CRACKING T.C.C.CYCLE VARIABLE THERMAL REFORMING | | | RECYCLE CAT. CRACKING VIS BREAKING + THERMAL NO REFORMING | RECYCLE CAT. CRACKING VIS BREAKING NO REFORMING-NO THERMAL |
|---|---|---|---|---|---|---|---|---|
| CASE NO. | 1A | 1B | 1C | 2A | 2B | 2C | 3 | 4 |
| PRODUCTS | B/CD | B/CD | B/CD | B/CD | B/CD | B/CD | B/CD | B/CD |
| 10# R.V.P. Gasoline | 4740 | 4843 | 4975 | 5346 | 5491 | 5722 | 5941 | 5516 |
| Kerosene | 1500 | 1500 | 1500 | 1500 | 1500 | 1500 | 1500 | 1500 |
| Diesel Fuel | 1100 | 1100 | 1100 | 1100 | 1100 | 1100 | 1100 | 1100 |
| #2 Fuel | - | - | - | - | - | - | - | 656 |
| Residual Fuel | 2067 | 2045 | 2003 | 1391 | 1369 | 1327 | 1078 | 949 |
| Excess Butane | 20 | - | - | 132 | 74 | - | 70 | 74 |
| Dry Gas (F.O.E.) | 696 | 636 | 522 | 685 | 623 | 509 | 478 | 329 |
| Crude Run | 10,000 | 10,000 | 10,000 | 10,000 | 10,000 | 10,000 | 10,000 | 10,000 |
| PROCESS EQUIPMENT | B/SD | B/SD | B/SD | B/SD | B/SD | B/SD | B/SD | B/SD |
| Crude Distillation | 11,100 | 11,100 | 11,100 | 11,100 | 11,100 | 11,100 | 11,100 | 11,100 |
| Thermal Cracking Gas Oil | - | - | - | 1870 | 1870 | 1870 | 1100 | - |
| Thermal Cracking Red Cr. | 5000 | 5000 | 5000 | 1665 | 1665 | 1665 | 1665 | 1665 |
| Thermal Reforming | 1775 | 1155 | None | 1775 | 1155 | - | - | - |
| T. C. C. | - | - | - | 4060 | 4060 | 4060 | 8120 (1) | 8120 (1) |
| Catalytic Polymerization | 200 | 170 | - | 345 | 308 | 227 | 288 | 254 |
| OCTANE NOS. | | | | | | | | |
| C.F.R.M. + 0 cc T.E.L. | 69.8 | 68.2 | 62.7 | 74.0 | 72.7 | 68.3 | 69.2 | 69.0 |
| T.E.L. To 76 C.F.R.M. | 0.75 | 1.10 | 2.10 | 0.13 | 0.30 | 0.85 | 0.75 | 0.75 |
| T.E.L. To 78 C.F.R.M. | 1.20 | 1.60 | 2.90 | 0.35 | 0.65 | 1.30 | 1.20 | 1.20 |
| T.E.L. To 80 C.F.R.M. | 2.00 | 2.40 | 3.80 | 0.73 | 1.15 | 1.90 | 1.80 | 1 5 |
| T.E.L. To 82 C.F.R.M. | 2.90 | 3.50 | 5.30 | 1.30 | 1.80 | 2.75 | 2.60 | 2 50 |

(1) Total Feed - 1:1 Recycle Ratio

TABLE 6

SUMMARY OF YIELDS AND PROCESS EQUIPMENT
(No Diesel To Sales)

| TYPE OPERATION | THERMAL CRACKING VARIABLE THERMAL REFORMING | | | CATALYTIC CRACKING + VIS BREAKING THERMAL CRACKING T.C.C. CYCLE VARIABLE THERMAL REFORMING | | | RECYCLE CAT. CRACKING VIS BREAKING + THERMAL NO REFORMING | RECYCLE CAT. CRACKING VIS BREAKING NO REFORMING |
|---|---|---|---|---|---|---|---|---|
| CASE NO. | 5A | 5B | 5C | 6A | 6B | 6C | 7 | 8 |
| PRODUCTS | B/CD | B/CD | B/CD | B/CD | B/CD | B/CD | B/CD | B/CD |
| 10# R.V.P. Gasoline | 5529 | 5636 | 5804 | 6168 | 6309 | 6541 | 6796 | 6239 |
| Kerosene | 1500 | 1500 | 1500 | 1500 | 1500 | 1500 | 1500 | 1500 |
| #2 Fuel | - | - | - | - | - | - | - | 979 |
| Residual Fuel | 2264 | 2242 | 2200 | 1611 | 1589 | 1547 | 1228 | 949 |
| Excess Butane | 21 | - | - | 115 | 70 | - | 100 | 94 |
| Dry Gas (F.C.C.) | 688 | 825 | 711 | 826 | 764 | 650 | 552 | 375 |
| Crude Run | 10,000 | 10,000 | 10,000 | 10,000 | 10,000 | 10,000 | 10,000 | 10,000 |
| PROCESS EQUIPMENT | B/SD | B/SD | B/SD | B/SD | B/SD | B/SD | B/SD | B/SD |
| Crude Distillation | 11,100 | 11,100 | 11,100 | 11,100 | 11,100 | 11,100 | 11,100 | 11,100 |
| Thermal Cracking Gas Oil | - | - | - | 2450 | 2450 | 2450 | 1444 | - |
| Thermal Cracking Red. Cr. | 6225 | 6225 | 6225 | 1665 | 1665 | 1665 | 1665 | 1665 |
| Thermal Reforming<br>T. C. C. | 1775<br>- | 1155<br>- | - | 1775<br>5290 | 1155<br>5290 | -<br>5290 | -<br>10,548 (1) | -<br>10,548 (1) |
| Catalytic Polymerization | 254 | 200 | 77 | 437 | 402 | 348 | 368 | 322 |
| OCTANE NO. | | | | | | | | |
| C.F.R.M. + 0 cc T.E.L. | 69.8 | 68.7 | 63.9 | 74.6 | 73.3 | 69.4 | 70.4 | 70.3 |
| T.E.L. To 76 C.F.R.M. | 0.85 | 0.95 | 1.95 | 0.15 | 0.20 | 0.75 | 0.60 | 0.60 |
| T.E.L. To 78 C.F.R.M. | 1.35 | 1.50 | 2.70 | 0.40 | 0.50 | 1.20 | 1.03 | 1.02 |
| T.E.L. To 80 C.F.R.M. | 2.10 | 2.25 | 3.60 | 0.80 | 0.95 | 1.80 | 1.60 | 1.55 |
| T. E. L. To 82 C. F. R. M. | 3.10 | 3.30 | 5.00 | 1.50 | 1.60 | 2.70 | 2.35 | 2.25 |

(1) Total Feed - 1:1 Recycle Ratio

TABLE 7

SUMMARY OF YIELDS AND PROCESS EQUIPMENT

(Diesel and Asphalt to Sales)

| TYPE OPERATION: | Thermal Cracking and Reforming | Catalytic Cracking, Thermal Cracking TCC Cycle |
|---|---|---|
| CASE NO : | 9 | 10 |
| PRODUCTS | B/CD | B/CD |
| 10# RVP Gasoline | 4,710 | 5,708 |
| Kerosene | 1,500 | 1,500 |
| Diesel Fuel | 1,100 | 1,100 |
| Residual Fuel | 1,429 | 755 |
| Asphalt | 600 | 600 |
| Excess Butane | 36 | - |
| Dry Gas (F.O.E.) | 670 | 445 |
| Crude Run | 10,000 | 10,000 |
| PROCESS EQUIPMENT | B/SD | B/SD |
| Crude Distillation | 11,100 | 11,100 |
| Vacuum Reduction | 3,330 | 1,665 |
| Thermal Cracking Gas Oil | 4,330 | 2,000 |
| Thermal Cracking Reduced Crude | - | - |
| Thermal Reforming | 1,775 | - |
| T.C.C. | - | 4,330 |
| Catalytic Polymerization | 210 | 271 |
| OCTANE NOS. | | |
| CFRM + 0 cc TEL | 69.9 | 68.6 |
| TEL to 76 CFRM | 0.80 | 0.90 |
| TEL to 78 CFRM | 1.35 | 1.35 |
| TEL to 80 CFRM | 2.00 | 2.00 |
| TEL to 82 CFRM | 3.05 | 2.90 |

tor fuel octane number with a minimum of TEL.

A series of charts has been prepared to illustrate the relation of catalytic and thermal cracking under the basic conditions assumed. Figure 3 illustrates the relative earnings per year for thermal and catalytic cracking. It will be noted that over the entire range of octane numbers the earnings for catalytic cracking far exceed those for comparable thermal cracking; also, as might be expected, recycle catalytic cracking involving the highest production of catalytic gasoline also shows the highest earnings.

Figure 4 has been constructed to show the value of catalytic cracking in relation to the increased investment required. Earnings above investment have been determined for a period of 10 years for both thermal and catalytic cracking cases. The difference between straight thermal cracking and recycle catalytic cracking at the end of 10 years is shown to be approximately $2,500,000 at a 76 octane level and $3,250,000 at an 80 octane level. It will be noted that no comparison is shown above 80 octane number since such an operation would be impractical without excessive use of tetraethyl lead for straight thermal cracking.

Figure 5 illustrates, as a function of octane number, payouts of the differential investment between catalytic and thermal cracking. These payout periods are, of course, of only relative significance since a careful analysis of such individual refinery situation is necessary before the true picture can be determined. Investment figures are predicated upon normal construction costs, and while it is recognized that such may vary with local labor conditions and individual refinery specifications, these figures used in this

TABLE 5

THERMOFOR CATALYTIC CRACKING YIELDS

| CASES: | 2 | 6 | 3 | 1 | 10 |
|---|---|---|---|---|---|
| **TAR SEPARATOR CHARGE, BPCD** | | | | | |
| Diesel Fuel | - | 1,100 | - | 1,100 | - |
| Topped Crude | 4,500 | 4,500 | 4,500 | 4,500 | 4,500 |
| Visbreaker Gas Oil | 655 | 655 | 655 | 655 | - |
| TCC Recycle | - | - | 3,655 | 4,755 | - |
| Total | 5,155 | 6,255 | 8,810 | 11,010 | 4,500 |
| Tar Separator Bottoms | 1,500 | 1,500 | 1,500 | 1,500 | 1,500 |
| Vacuum Gas Oil | - | - | - | - | 900 |
| TCC Reactor Charge, BPCD | 3,655 | 4,755 | 7,310 | 9,510 | 3,900 |
| **YIELDS BASED ON FRESH CHARGE* Vol.%** | | | | | |
| Debut, Motor Gasoline | 42.0 | 41.6 | 56.0 | 55.5 | 42.6 |
| Catalytic Gas Oil | 46.0 | 46.5 | 27.0 | 27.5 | 46.2 |
| Isobutane | 3.7 | 3.8 | 7.0 | 7.0 | 3.7 |
| Normal Butane | 1.5 | 1.5 | 2.0 | 2.0 | 1.5 |
| Butylenes | 4.7 | 4.6 | 5.9 | 5.8 | 4.9 |
| Propylene | 3.3 | 3.3 | 3.9 | 3.8 | 3.4 |
| Dry Gas (F.O.E.) | 7.6 | 7.3 | 8.9 | 8.3 | 7.8 |
| **PROPERTIES OF FRESH REACTOR CHARGE*** | | | | | |
| Gravity, °API | 29.5 | 31.0 | 29.5 | 31.0 | 26.5 |
| Aniline No., °F. | 185 | 175 | 185 | 175 | 190 |
| Vac. Distillation | | | | | |
| 10% | 570 | 520 | 570 | 520 | 570 |
| 50% | 740 | 670 | 740 | 670 | 780 |
| 90% | 915 | 890 | 915 | 890 | 980 |

* Includes Visbreaker Gas Oil but Excludes TCC Recycle

report are consistent and therefore comparable. Often utilization of existing equipment in conversion of thermal to catalytic cracking will reduce investments very substantially and make the payout even more attractive.

Figure 6 shows the effect of refinery gasoline price on earnings per year and earnings after 10 years taken at the 80 octane level.

Figures 7 and 8 illustrate the octane yield relationship for thermal cracking, once-through catalytic and recycle catalytic cracking. These graphs make it evident that not only is there a large advantage in gasoline octane number and TEL requirement for catalytic cracking but there is also a very substantial advantage in overall gasoline yield. For example, when producing 80 octane number motor gasoline containing about 2 cc TEL, there appears to be a yield advantage of 12-13% for recycle catalytic cracking over thermal cracking only. Figure 9 illustrates lead requirement, as a function of octane number, for several of the cases studied. These curves emphasize again the value of catalytic cracking in producing high octane number gasolines of low TEL content.

Delayed coking for the preparation of gas oil charge is a highly attractive process for those refiners who desire a minimum of heavy fuel oil and who can dispose of petroleum coke.

The studies presented in this paper lead to a number of interesting and practical conclusions:

1. TCC catalytic cracking is now available for the small

## TABLE 9

## THERMAL CRACKING YIELDS

| CASES: | 1 | 5 | 2, 3, 4<br>6, 7, 8 | 3, 7 | 9 | 10 |
|---|---|---|---|---|---|---|
| **CHARGE STOCK, BPCD** | | | | | | |
| Gas Oil | - | - | - | - | 3900 | - |
| Reduced Crude | 4,500 | 5,600 | 1,500 | - | - | - |
| Catalytic Gas Oil | - | - | - | 987 & 1308 | - | 1,799 |
| Gravity, °API | 25.0 | 27.0 | 15.5 | 25.0 | 26.5 | 30.0 |
| **YIELDS, VOL. %** | | | | | | |
| Debut. Motor Gasoline | 44.1 | 47.7 | 13.1 | 36.0 | 50.0 | 41.5 |
| Isobutane | 0.6 | 0.7 | 0.3 | 1.0 | 0.9 | 0.9 |
| Normal Butane | 2.0 | 2.4 | 0.9 | 3.2 | 2.4 | 3.0 |
| Butylenes | 2.1 | 2.5 | 0.7 | 2.8 | 2.7 | 2.6 |
| Propylene | 1.9 | 2.2 | - | 2.5 | 2.2 | 2.8 |
| Visbreaker Gas Oil | - | - | 43.7 | - | - | - |
| Fuel Oil | 44.5 | 39.3 | 41.3 | 46.5 | 35.0 | 42.0 |
| Dry Gas (Wt. %*) | 8.5 | 9.0 | 2.3 | 13.0 | 12.0 | 10.0 |

* $C_3$ and Lighter.

## TABLE 10

## REFORMING YIELDS

| CASES: | 1-A | 2-A | 1-B | 2-B |
|---|---|---|---|---|
| Naphtha Charge, B/CD | 1,040 | | 1,600 | |
| Charge Octane No. | 46.0 | | 49.0 | |
| **YIELDS, VOL. %** | | | | |
| Debut. Motor Gasoline | 76.4 | | 76.4 | |
| Isobutane | 1.2 | | 1.2 | |
| Normal Butane | 3.1 | | 3.1 | |
| Butylenes | 4.3 | | 4.3 | |
| Propylene | 3.3 | | 3.3 | |
| Fuel Oil | 4.0 | | 4.0 | |
| Dry Gas (Wt. %) | 15.0 | | 15.0 | |
| Debut. Motor Gasoline Octane No. | 68.0 | | 69.0 | |

refiner. Studies have been prepared which show that the process is feasible for the refiner processing 3,000 or more barrels per day of crude oil.

2. The competitive market for motor fuel points toward higher gasoline octane numbers in the future. Catalytic cracking will, in many cases, be the only means of economically reaching these competitive levels.
3. The earnings from catalytic cracking at a given octane level are, in nearly every case, sufficiently greater than for thermal cracking to justify its installation.
4. Reduction in yield of residual fuel makes for greater flexibility in meeting many local market conditions.
5. Substantial investment savings can be achieved in many cases by using existing thermal equipment.

---

GIVE TO THE WAR CHEST

## Patterson Reports On Trucking Conditions

With all restrictions on truck sales definitely set to end by December 1, and with the process for return to normal started by the closing of applications September 22, the West has entered the bright era of truck transportation to which it has so long looked forward, according to Wilson D. Patterson, manager of the Pacific Coast Region, The White Motor Company.

Now that no more applications for new trucks will be received, orders covered by prior applications will be filled as soon as possible, Mr. Patterson pointed out. During the period from October 1 to November 1, the "freeze" interim, the manufacturer will be able to build up some reserve and get trucks in the hands of distributors.

From November 1 to December 1 there will be an orderly allotment of any previously unassigned new trucks in stock on the preferential basis—that is, to those operators who are badly in need of new equipment, and who have been unable to acquire it under wartime government regulations, the Pacific Coast White official stated.

From December 1 on, according to Mr. Patterson, the field is "wide open" and trucks will be sold under normal business conditions. However, the White executive cautioned, ability to produce new trucks will be far behind the demand for them for some time to come. "We have every reason to believe," he said, "that October, November and December will see a real improvement in production and should represent as high as a 50 to 60 per cent increase over the previous months of this year."

With the release of all War Manpower controls, Patterson declared, it is now possible to make personnel additions on both shop and parts departments in White branches and distributors' plants. Bringing these two essential operating points up to new high standards will make possible the high standard of service rigidly maintained by White under normal conditions, it was pointed out. Patterson emphasized that, until trucks were actually available, the necessity for rigid control of maintenance should still be the operator's first thought.

"Fortunately, so far as White is concerned," Mr. Patterson declared, in summing up the present situation, "we have spent the past three years planning and developing methods which we could put into operation when the war was over. We are now going to have the opportunity to test these plans and our ability to follow them through. We have every confidence that our plans are so sound and our organization so solid and of such high quality, that we shall be able to measure up in every way to the objectives that we have set up."

---

## Yorba Linda Area Scene of New Try

Scoggins & Long have foundation in for an interesting wildcat test on ground a short distance north of the Santa Ana Canyon field, in the Yorba Linda area.

The drill site is within the confines of the Travis property on sec. 24-3s-9w, Orange County, a point east of any established production in the Los Angeles Basin.


Johnston Stainless Welding Rods

PROVEN QUALITY SINCE 1931

•

A. P. JOHNSTON

1845 E. 57th St. - Los Angeles 11, Calif.

# Kern County Oil News

At the end of last week some oilmen looked tired and some registered their first postwar gripe about something different than taxes, or lack of manpower . . . it was lack of willingness to work and slack of business.

To Kern County as a whole, however, came good reports on wildcats and considerable shop talk on "Oceanic" in Cymric area near Sheep Springs. If anyone needed a sign that the war was over he had it with the stock market and the geology boys bidding, buying and selling according to their best "know-how" after scouting the well. Independent Exploration Company's Oceanic is now trying for Belridge Sand and the honeymoon is over with the first basement not showing fashions in sand as expected. Another reason for looking tired.

From Kern's Edison's eastern fringes the story was different. Jergins' Harry Campbell, fresh up from Los Angeles, was mighty enthusiastic about its new 100 barrel an hour baby.

Paul J. Howard, deputy assessor for Kern, was receiving congratulations on his new well at Montebello. However, this is not his well . . . just another Paul J. Howard . . . the nursery man who has been trying to get surface rights instead of oil rights . . . which is oil right, too . . . and it is strange how every time he touches something it turns to oil. Kern's Paul J. Howard, when he touches upon any subject it also turns to oil—oil talk.

Judge W. C. Robertson of McKittrick is a typical small independent oil operator as far as assets go to measure up the black gold business. In the county seat at last week's beginning he was more than usually informative on conditions of the independents at postwar. His bull was being gored.

Union, Jergins and Trico are doing all right with new business extension and these wells are brand new for Kern's increasing returns. There are some cutbacks in Kern, too, but still a good county in which to do all the business that one just about needs at present. The quarterly surpluses are being wildcatted back nicely as the country goes into the last part of the calendar.

Kern County Fair was an even greater success than imagined or looked. This pleased oil men who are perfectly willing to see livestock and farms increase in value to help pay taxes. One day this month a Guernsey sale followed the fair. Top heifer brought $1200 while the best bull rang the cash register for $1000 even. The future looks even brighter as the sales 24 out of 36 went to Future Farmers of America or the FFA. Your scribe is the only nearest oilman which has an honorary membership in FFA. As the nearest farmer on oil bull session, he might apply to API for similar membership.

Speaking of auctions, let this be a rejoiner to oilwigs. Whenever oilmen enter the ringside of bidders never speak to your neighbor until after the sale. Last month two nods and a raised salute bought three head of prize livestock at a pretty penny. The scramble out was embarrassing for one. So whenever an oilmen gets a duster it is impolite to mention dust in his home.

Concerned but not hampered were many oil operators in appraising the recent strike threats here in Kern. However, most of the work was talkfest and no actual serious loss in man hours. This came hard on the heels of your news reporter who boasted last month on the harmony between OILWIGS bosses and OILRIGS crews. Still may be able to do so.

To this department at long last has come the supplemental supporting interest of the space which is precious and makes possible the Kern County Oil News. Emmons, El Tejon and Oil Field Construction.

Kern folks have been more than grateful to Western Oilfields Supply Company which has had to do most of the supporting in more ways than one by its superb display advertising. Thanks to Charlie Lake, who also caused others to apply for white space at the Los Angeles facility. This month your attention is called to the new neighbors which

**SAN JOAQUIN GEOLOGICAL SOCIETY MEETS AGAIN**

**J. D. Cerkel of USGS at Taft is vice president of the SJGS and he is shown here with his fellow officers at the first fall meeting which was resumed Tuesday, October 9. Jim Sheller of Richfield Oil was Captain in the Army Air Forces and told of his experiences with the B-17's of the 7th Air Force in England. His story was real different and most unusual in his shuttle flying experience. Big, tall and handsome Glenn Ledingham, Western Gulf's top flight geologist, is president of SJGS and with him at the extreme right is hard coring Secretary Herm Weddle from big Standard's geoloical engineering facility.**

California Oil World has grouped into the Kern news zone. Congratulations. Your reporter will be out for a story of operations and history background.

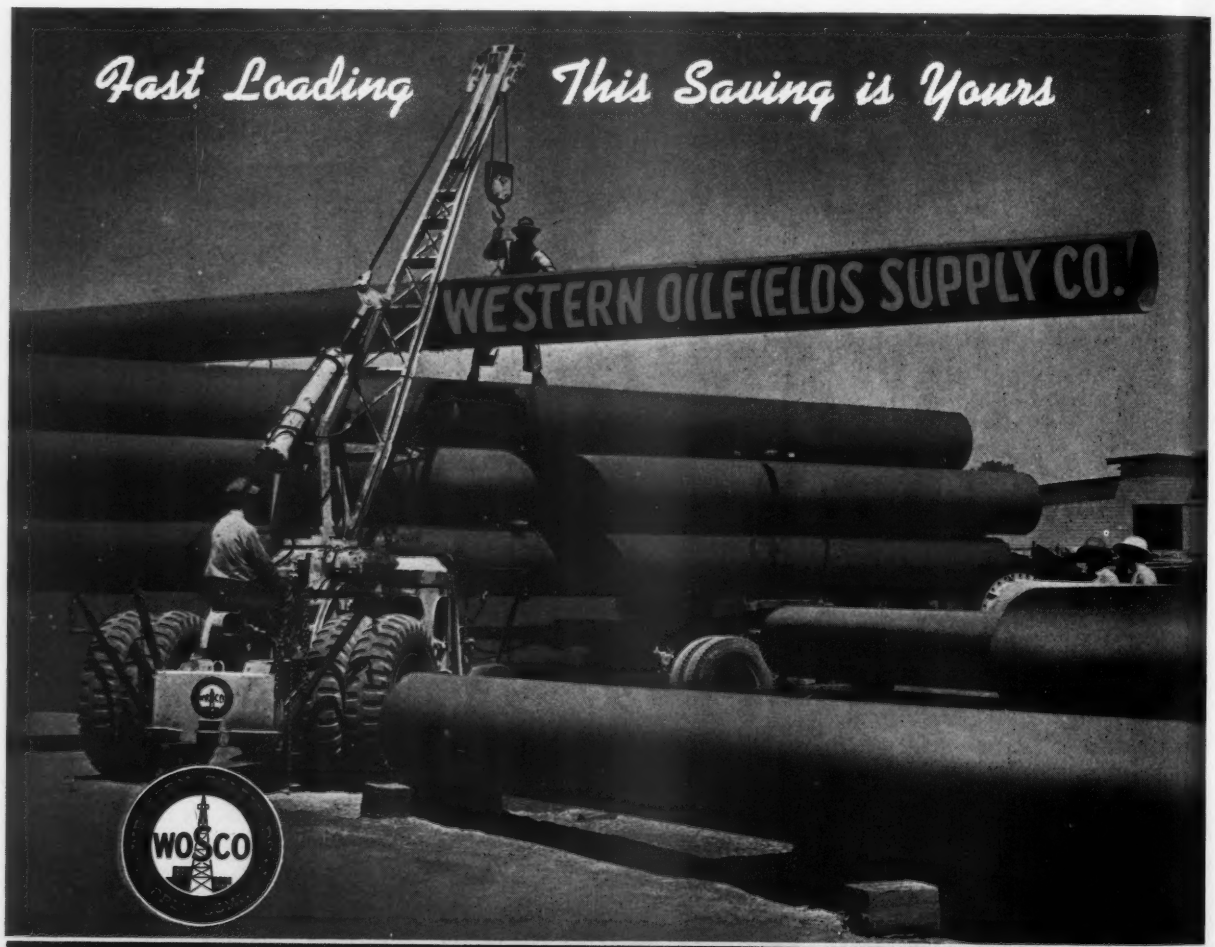
Kern Oil News, now ten months old, has earned its spurs and takes on new life. At year's end its first anniversary may go to color in its masthead.

---

"One-half of the people do not know how the other half live." This axiom, now a bromide, does not apply to the oil fraternity. Ever since the Kern County "Scouts" threw away their field glasses for "round-table" bull sessions every scout knows not only how the other scout lives, but he tries to live with him. And so late this week every oilwig and fellow-traveler knew that leases were "down" . . . but the indomitable spirit of Kern oilmen showed continued returns in optimism. In short, Kernwigs are not worrying about anything because the oil situation here is a natural to get worse before it gets better. Topflight opinion is: "Kern County should worry" . . . certain voluntary cutbacks are trivial.

"Exercised," as the colloquilism goes, are the oilfolks here who hear that reconversion has got anything to do with their prosperity. The total new wells this year now reads 1727 as against 1725 a year ago. Of thirty-five new California wells drilled from October 1 to 6, 15 were Kern owned.

Mohawk went back to work and this has had a tendency to cheer producers who have long had faith in the oil employer-employee relations which have been excellent from a period known as "long standing". Kern has proven that it can


WESTERN OIL FIELDS SUPPLY CO.

HIGHWAY 99, • BAKERSFIELD, CALIFORNIA, PHONE 6-6724

live up to its public and labor relations reputation.

By October 15 deepening or redrilling jobs numbered 20 as compared with 16 during the previous week in Kern County.

To Tulsa a fortnight ago went Kern County oilmen in good numbers to participate in the sixteenth annual session of the IPAA. Local directors and the state vice presidents opened the meeting with premeeting sessions. Programs were keyed to the problems of reconversion for peace time needs. At the same time plans were laid for building a domestic industry capable of supplying all the oil required for the period ahead.

Joe McDonald, the criterion of the Independents, is in Kern again this month's end for a visit to the "Monestary" and the usual conduct of business in the Golden Empire. Accompanying him is his daughter, Mrs. J. M. Thomas, who assists in the public relations role of spraying some of the oil upon troubled waters as interests may appear around the informal oil sessions of the independents at El Tejon Hotel.

Kern's Independent Natural Gas Association of California, comprised of oil organizations that produce as little as 100 cubic feet per day, have been organized with the main offices located in Los Angeles. Kern's Robert Patterson of Belridge is a member of the committee on organization.

Twenty cents a barrel subsidy for all crude oil produced from Torrance "34" pool was a topic of interest to "Kern Chapter of Stripper Wellwigs." The price regulation is retroactive as of September 1, as you readers know.

Synthetic tires and their improvements as shown by the local Goodrich dealers here in Kern are the first postwar tires (new design) in passenger automobile requirements since Pearl Harbor. In June, 1940, the same company introduced the first synthetic automobile tires on the general market in Kern county as "the one best way to focus attention on the nation's then precarious rubber supply situation."

Ralph Bradford, general manager of the big Chamber of Commerce of the U. S., came through Kern County a fortnight ago. He pointed

**HYDRAULIC WELL PULLING AND WELL SERVICING**

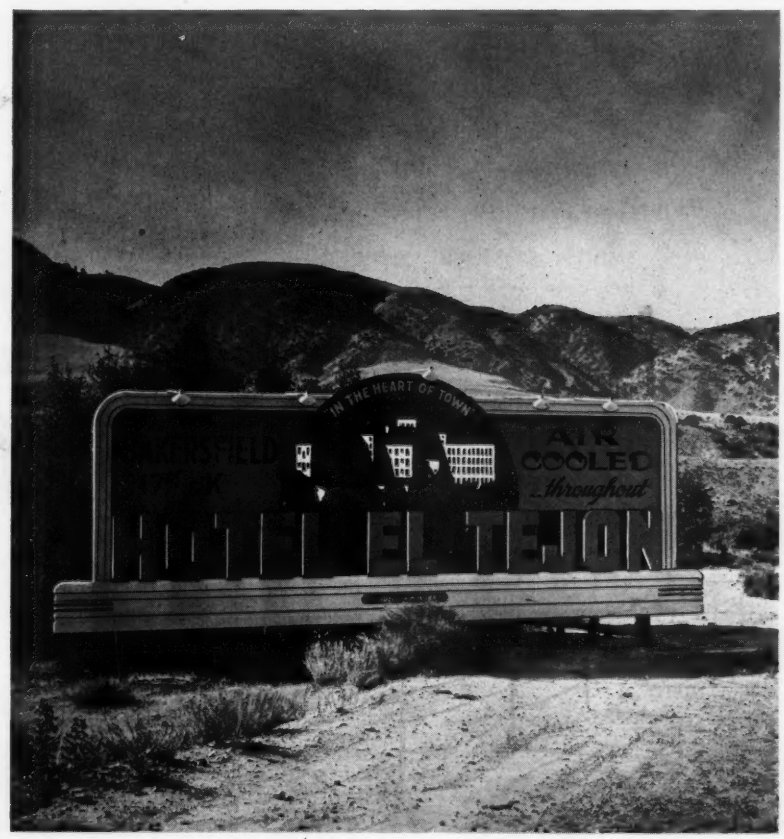
**LINE PIPE CASING • OIL WELL SUPPLIES**

**The E. C. EMMONS SUPPLY CO.**

**P. O. Box 164** **501 Supply Row**

**Phone 36**

**Taft, California**



out that the oil men are still the exponents of American free enterprise and recommended that other interests spend more time working at it (free enterprise) than talking about it. "No two representatives of business will define "free enterprise" alike, but everyone seems to be for it," he said. Recalling the water on troubled oils at the close of the last war, Mr. Bradford believes that extravagant demands will be met with extravagant denials, but that in the end this time labor relations must be a part of a program.

The petroleum industry is still a free and independent entity of the U.S.A. The contribution made by major and independents alike is more than just noteworthy during the past decade or more. However, with the progress of science, in spite of the fact that even alcohol is made from petroleum, the picture ahead, according to many a chemist, is not what some folks term as "too rosy". So the word "independence" is not always going to be the star to which the crown block hooks itself. In other words, there is going to be a selling job in public relations and research advertising. This advertising may be simple publicity or public relations. Therefore, let Kern County Oil News have a part in the work pattern. All of which means that you are invited to make a contribution in some form or other to this column so that you can share in the returns which must be humanistic as well as scientific. In short, "give us the lowdown" on human interest things.

## Standard Builds New Pipe Line

A new 175 mile pipe line costing more than $3,000,000 to link the San Joaquin Valley oil fields with San Francisco Bay, will be built by Standard of California within the next few months.

With pumping capacity of more than 90,000 barrels daily, the 18-inch line will run from Kettleman Hills, in Kings County, to Los Medanos, the oil company's big tank farm near Pittsburg, on the upper bay. Los Medanos supplies Standard's Richmond refinery.

Construction is expected to start in December, with completion scheduled for April.

This line will permit the Stanpac line to be reconverted to transportation of natural gas. Stanpac was changed over from natural gas to crude petroleum early in 1942 to meet the tanker shortage and is credited with having made possible the production records set by the Richmond refinery. Stanpac is owned jointly by Pacific Gas and Electric Company, Standard of California and Pacific Public Service Company.

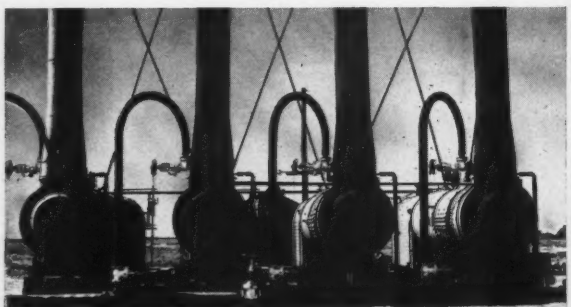
Bechtel Brothers-McCone Company, one of six bidders, was awarded the construction contract with a low bid of $1,002,400. Additional items included in the total cost are rights of way and 21,000 tons of pipe, which will be supplied by A. O. Smith Corporation of Milwaukee.

GIVE TO THE WAR CHEST


OIL FIELD CONSTRUCTION CO.

Boiler Plants, and Insulation
Brick and Structural Steel Work
Authorized Agent for Johns-Manville
INDUSTRIAL INSULATION

Northern Division
Highway 99, West of Circle, Bakersfield
C. E. MANLEY, Div. Manager
Phone 30750



BAROID PRODUCTS CUT COSTS BY MINIMIZING MANY DRILLING DIFFICULTIES

- ANHYDROX
- AQUAGEL
- AQUAGEL CEMENT
- BAROCO
- BAROID
- FIBROTEX
- IMPERMEX
- MICATEX
- SMENTOX
- STABILITE
- ZEOGEL
- TESTING EQUIPMENT
- BAROID WELL LOGGING SERVICE

BAROID SALES DIVISION
NATIONAL LEAD COMPANY
BAROID SALES OFFICES: LOS ANGELES 12 • TULSA 3 • HOUSTON 2

## C.N.G.A. Fall Meeting

*(Continued from Page 3)*

sures have increased enormously and much research has been necessary to explain behavior at these higher pressures. Had the committee been continued in existence, their recommendations could have been revised from time to time in recognition of advances in the art as reported by such engineers as Laverty, Gill, Edmister, York, and Ridgeway, or as developed by the committee. Similarly, in the other fields mentioned, engineers could be provided with recommended methods of procedure revised as frequently as additional research required. This work should be carried on by technical sub-committees. An endeavor should be made to include in such committees technical men from the refining divisions and from the engineering contracting companies.

The foregoing are a few of the ways in which, I believe, C.N.G.A. can become of greater service to its members and to industry. None of them may meet your particular need. For this reason, I earnestly request your comments on the suggestions which I have made and solicit your proposals of services which will encourage the growth of C.N.G.A. and make the Association of greater service to you and to our industry.

## GM Multiple-Engine Power Units Described in New Literature

The Detroit Diesel Engine Division of General Motors Corporation have just issued the first literature on their Multiple-Engine Power Units.

This literature is available to interested parties by writing the company at the Philtower Building, Tulsa, Okla., or by writing the Anderson-O'Brien Company at 746 E. Washington Blvd., Los Angeles.

**STATEMENT OF OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACTS OF CONGRESS OF AUGUST 24, 1912, AND MARCH 3, 1933.**

Of California Oil World, published twice-monthly at Los Angeles, California, for October 1, 1945. State of California, County of Los Angeles, ss.

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Walter C. Monroe, who, having been duly sworn according to law, deposes and says that he is the President and Business Manager of the California Oil World, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Walter C. Monroe, 765 S. Plymouth Blvd., Los Angeles 5, Calif. Editor, Walter C. Monroe, 765 So. Plymouth Blvd., Los Angeles 5, Calif. Managing Editor, None. Business Manager, Walter C. Monroe, 765 So. Plymouth Blvd., Los Angeles 5, Calif.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member must be given): Petroleum Publishers, Inc., 117 W. 9th St., Los Angeles 15, Calif.; M. K. Miller, Jr., 7367 Hollywood Blvd., Los Angeles, Calif.; Walter C. Monroe, 765 So. Plymouth, Los Angeles 5, Calif.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

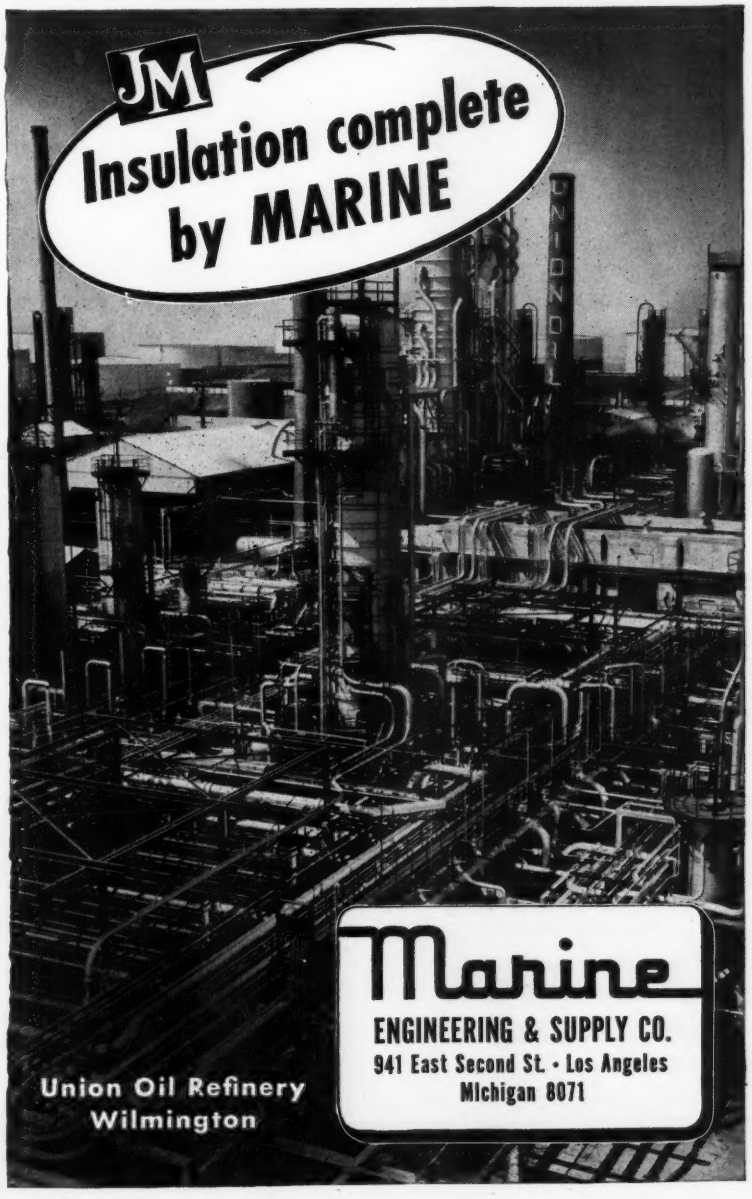
4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the 12 months preceding the date shown above is: (This information is required from daily publications only.)

WALTER C. MONROE
(Signature of editor.)

Sworn to and subscribed before me this 24th day of Sept., 1945.

(SEAL) GLADYS BOWEN,
(My commission expires Feb. 26, 1947.)



with HYDRIL
"TWINPIN"
OS* DRILL PIPE CONNECTORS
API or HYDRIL THREAD
Every thread in the string is a MAKE-UP THREAD

...AND HERE'S WHAT THAT MEANS TO YOU

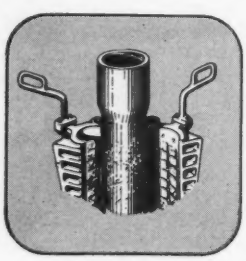
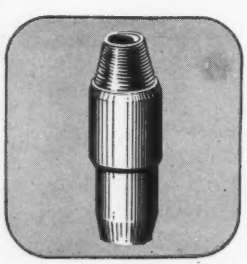
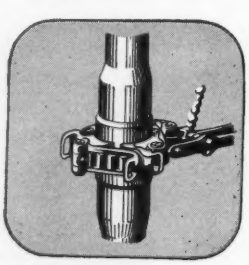
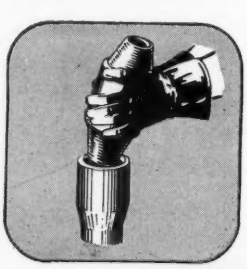
Because they do away with all the complications of drill pipe thread and tool joint thread in the same joint, HYDRIL "TWINPIN" OVERSIZE DRILL PIPE CONNECTORS give you a flexibility in drill string handling impossible with ordinary joints.

**IT'S EASY TO REVERSE THE ENTIRE STRING WHEN MOVING TO A NEW LOCATION**

**. . . DISTRIBUTING THREAD WEAR**
**. . . DISTRIBUTING SLIP CUT**
**. . . DISTRIBUTING TONG WEAR**

* OS Means Oversize

***HYDRIL OS* "TWINPINS" — Combined wear subs and connectors — mean longer drill pipe life***

# HYDRIL

HYDRIL-MADE TOP GRADE

HYDRIL COMPANY • 714 WEST OLYMPIC BLVD. • LOS ANGELES 15, CALIF.

# THIS LAUGH

# OFF!!

Here's a story about a British Army chaplain. It must be true, since it was told to us by a Britisher and a chaplain.

About forty years ago the chaplain was standing alone in a South African farmyard, surrounded by a brick wall and holding a magazine rifle charged with eight rounds. Suddenly and with a horrifying roar, a lion raised its head above the wall. Recovering from his surprise, the chaplain fired at the lion, which immediately ducked out of sight below the wall. A moment later the lion bobbed up again, still roaring frightfully. Again the chaplain fired. Once more the lion disappeared momentarily, but again raised its fearful head above the wall and roared some more. Once more the chaplain fired.

Again and again, eight times in all, the lion raised its head and roared and the chaplain fired. Then followed silence. No more the lion looked over the wall; there was no more roaring. After a decent and discreet interval the chaplain walked cautiously to the wall and looked over. There he saw eight dead lions!

---

If the paper shortage gets any worse they'll have to make shoe soles out of leather again.

---

If she calls you to her bedroom
In the middle of the night,
And through half-closed eyelids
You detect a telltale light,
If her bosom heaves tumultuously
Like the tide upon the ocean,
And her voice is soft and tremulous
Betraying her emotion
If her nostrils dilate widely
With each panting labored breath
And her shapely body trembles
As if approaching death,
If she beseeches and implores you
As she grasps your trembling hand
To alleviate her sufferings
The torture of the damned—
THAT'S ASTHMA ! ! !

A lovely little old lady spent days working on a pair of men's pajamas which she contributed to the Red Cross. "I made them myself," she said sweetly. They were perfect in every detail except that there was no opening in the front of the pants. The inspector hated to hurt her feelings but he explained the error to her. The dear old lady's face fell. Suddenly, however, she brightened. "Couldn't you give them to a bachelor?" she said.

---

A professional reformer was accosted in a hotel lobby by a young, pretty, intelligent looking girl. Sensing an opportunity to do something for her, he invited her to sit down and have a talk with him.

"Tell me," he said to her, "just how such a bright and pretty young girl like you happened to get into such a racket?"

"I really don't know, sir," she replied naively, "I guess I was just lucky."

---

Two men got off a bus. One of them had come to town for good. The other was an oil man on vacation.

---

"Pa, tell me how you proposed to Ma," requested the young hopeful.

"Well, Son, as I remember it was like this. We were sitting on the sofa one night at her house. She leaned over and whispered in my ear. I said, 'the Hell you are' and the next day we got married."

---

"I wish to marry your daughter, Sir."

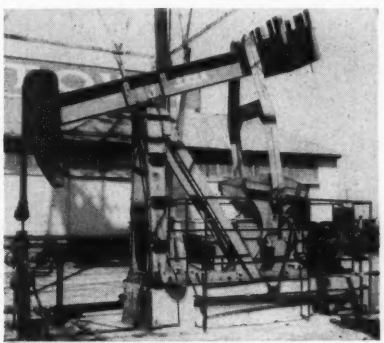
"Do you drink, young man?"

"Yes, indeed, Sir, but let's get this other matter settled first."

---

President Truman still has the biggest task before him. It isn't going to be easy convincing the American public that there isn't any Santa Claus.

Then there's the one about the aeronautical engineer who is confused because the gals with the most streamlined figures usually offer the most resistance.

**Tough Jobs bring out JENSEN qualities**

**The other day we heard it said that any man who drives at high speeds and over bad roads soon discovers that some cars are much better than others.**

**It is that way with pumping equipment. Producers are much more likely to get interested in JENSEN Units for tough jobs. It takes a troublesome well to bring out all the good qualities in a JENSEN, although ANY well is likely to be more profitable and satisfactory when JENSEN equipped.**

**California Representative:**
**A. V. TURNER**
**445 W. 6th. Downey, Calif.**
**Phone: Topaz 2-2410**

**Stocked by**
**THE OIL TOOL CORPORATION**
**3075 Cherry Avenue, Long Beach, Cal.**
**Phone 481-81**

**JENSEN**
**BROTHERS MFG. CO.**
**14th and Pacific Streets**
**COFFEYVILLE, KANSAS, U. S. A.**
**EXPORT OFFICE, 50 Church St.**
**New York City**

## Carrington King

*(Continued from Page 1)*

ent oil men who fought the old Atkinson conservation bill in 1938 are preparing to do battle once more but, so far, seem handicapped by the lack of an opponent. If the industry is thinking about a State law, or some other form of control it isn't talking.

Some oil men feel a law to enforce conservation in the California fields is not as necessary now as it was before the war. Flush production has been taken out of the State; the storage situation is changed and many operators are believed to have picked up valuable pointers on the need for sensible regulation and well-spacing from the experiences gained while operating under war-time restrictions imposed by the Petroleum Administration for War.

Even though no indication has yet been discovered of a desire on the part of the industry to press for State conservation legislation, the uneasy feeling persists that California should join the other oil-producing States in working out a proration program. Tagged as a "maverick" State where conservation laws are concerned, California will remain vulnerable to Government attacks until it adopts some policy of production control.

Membership in the Interstate Oil Compact Commission might be one solution. This Federally-approved group now numbers 13 oil-producing States as members.

Regarding Ickes' remarks on the need for a conservation law in California, the Secretary told his press conference that "since it is the second oil-producing State in the country, I think it is more reprehensible than any State in the country in not having a conservation law." Pointing out that such a law was passed twice but "struck down on referendum," Ickes took to task State Atty. Gen. Robert W. Kenny for failing to press for legislation.

"It mightn't be a bad idea for the Attorney General to do some heavy thinking on that subject instead of how to dodge the courts on the tidelands issue," Ickes said, with a left-handed slap at Kenny for his efforts to settle the tidelands ownership matter in favor of the States.

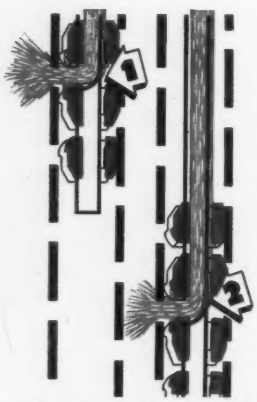
In addition to rebuking Kenny, Ickes again attacked William M. Keck, president of Superior Oil Co., Los Angeles, for playing "the worst possible part" in the 1938 controversy.

"According to my information, he really led the fight," Ickes declared. "It was as ugly and bitter and untruthful a fight as I have seen and he furnished a large part of the money."

---

Reports that the Interior Department would "throw the book" at proponents of the pending tidelands quitclaim legislation are being amply substantiated at the moment.

Topping its usually proficient job of lobbying in the Halls of Congress, Interior seemingly has successfully conveyed its impressions on the tidelands matter to some of the larger metropolitan dailies. Stories and editorials attacking the legislation in the Washington Post and the St. Louis Post-Dispatch are strictly patterned after the views expressed in public and in private by Ickes and some of his Interior Depart-

**Here's WHY the McGaffey-Taylor PRESSURE WASHER DOES A REAL WELL WASHING JOB**

**Power — plenty of power to break up the solidified material clogging the slots or perforations, or to scour filter cake from the formation face . . . that's WHY an M-T Pressure Washer really gets results. And here are the TWO reasons it has such tremendous power: (1) The packers can be placed as close together as ¼ inch, confining all the pressure of the wash fluid to a tiny space and building up terrific jetting action. (2) The entire packer assembly moves the full length of the stroke, bringing that powerful jet against every inch of wall or liner.**

**In short, it acts just as you do when you wash mud off your driveway. You adjust the nozzle for a narrow stream to give greater force, and you sweep that stream back and forth until the pavement is clean. But you'll want the full details on pressure washing, so**

***Write for NEW Well Washing Bulletin, or ask a representative to demonstrate transparent model.***

**McGaffey-Taylor**

CORPORATION

WELL-WASHING SERVICE

4052 CHERRY AVENUE, LONG BEACH 7, CALIFORNIA

ment officials. . . . Oil writers and others with long experience in covering the 10-year-old battle over tidelands ownership agree the present press campaign is being encouraged by the Department of Interior.

Perhaps the bill's supporters—the oil companies, title companies, State officials, municipal authorities, port authorities and others——were a bit on the naive side, in thinking they would not run into stiff opposition from Ickes and his friends on a matter so close to the Interior Secretary's heart as tidelands.

Perhaps they were wrong, also, in playing down the understandable interest of the oil companies in the underseas lands. While, actually, the oil industry has a relatively small investment in the billions of dollars' worth of property involved in any Federal action against tidelands titles,—the "big oil companies" provide a popular target for any newspaper campaign or political witchhunt.

The series of articles—two of which have appeared in the St. Louis and Washington papers at this writing—is chiefly devoted to an attack on California's Assistant Attorney General W. W. Clary, who drafted the legislation, and his activities in Washington.

Retention of the Los Angeles attorney (special counsel for the Title Insurance & Trust Co. was specially deputized by Atty. Gen. Kenny to head the tidelands fight) by the State of California, with the understanding his fee for drafting the bill "would be paid in part by the State and the balance by the major oil companies of the State and other tidelands lessees" is made much of in the articles. Clary's visits to prominent members of Congress to discuss the legislation also receive much space.

Edwin W. Pauley, American member of the Allied Reparations Commission and former Democratic National Committee treasurer, came in for his share of publicity in the Post and Post-Dispatch tidelands series. The president of Petrol Corp. was quoted as admitting he had "heavy financial investments in the tidelands" in a piece describing trips made to the Capitol with Clary on which Pauley introduced the Deputy Attorney General to three unidentified members of the Senate, Chairman Hatton Sumners of the House Judiciary Committee and other lawmakers interested in the legislation.

While the commotion raised by the alleged expose of the tidelands legislation (much of it already well-known to the trade press) continues in Washington, the Senate Judiciary Committee is backing and filling in indecision over when to start hearings on the red-hot measure. Latest report is that the group has set Dec. 4 and 5 as the "tentative" date. Congress, however, is likely to vote itself a liberal Christmas holiday,—in which case the hearings will go over until next January.

While the tidelands resolution still is expected to pass the Senate without too much difficulty, the fur will fly during the hearings. The bill's opponents will bear down on the "oil and politics" angle. . . . What tack will be taken by the proponents

*(Continued on Page 60)*

**NO METAL!** ***STRONGLY REINFORCED IN RIM FOR STRENGTH AND FLEXIBILITY . . .***

***CAN'T KINK...CAN'T BREAK!***

**These tough, long-lived, oil resistant rubber wipers last longer than ever before, giving you quick, clean, easy handling of drill pipe; clean floors for safer footing; no tools or tong dies down the hole.** ***LOWER IN COST, TOO!***

***FOR LIGHTNING SERVICE, CALL***

**MEDEARIS**

***Oil Well*** **SUPPLY CO.**

**8638 Otis Street, South Gate, California**

**BAKERSFIELD VENTURA AVENAL**

# Field Development

PREPARED BY CALIFORNIA OIL WORLD NEWS SERVICE

## Los Angeles Basin

### Wildcat Planned Near Palmdale

Approximately six miles northwest of the town of Palmdale, Del Sur Oil Co. is preparing to drill Del Sur No. 1 wildcat test, some 600 ft. south and 1000 ft. east of the center of sec. 26-7n-13w, Los Angeles County.

Half a century ago this part of the county was the habitat of teeming antelope herds and an area still reminiscent of pioneer days.

### L. A. City Test Drills Hard Shale

Seaboard Oil Co.'s soundproof test, located near the entrance of the Figueroa street tunnel, has reached a depth of 7235 ft. in hard cherty shale. An oil sand cored several hundred feet higher, promised little on formation trial.

### Ohio Testing Gardena Well

Perforating and customary trials are being continued in Ohio Oil Co.'s Gardena Comm. No. 1 wildcat near the town of Gardena on sec. 24-3s-14w, which was cored and drilled to a total depth of 10,594 ft. The 7-in. cp is at 10,353 ft.

### West Newport Field Active

Interest in West Newport field development continues with a dozen or more drilling jobs at various stages of operation.

D. D. and Dorothy Dunlap are drilling Aldrich Land Co. No. 2 on sec. 18-6s-10w at 1700 ft., and have made locations for Curtis No. 3 and No. 4.

Barnhart - Morrow Consolidated has reached 2210 ft. in Meyers No. 3. In the meantime, rig has been built for Newport Water Co. No. 1.

Foundations have been built for Delaney Pet. Corp., Karales No. 6 and No. 7. Little No. 4, bottomed at 2330 ft., is testing water shut off at 2307 ft.

Beverly Oil Co. is rigging up McCain No. 5. Standard has made location for its first well on its recently acquired McLeod Fee property.

Macoil Co. has completed Banning No. 26 for 100 barrels of 16.6 gravity oil a day, cutting 5 per cent from a total depth of 1765 ft. The 8⅝-inch casing is set at 1595 ft. Banning No. 4 is plugging after locating water on bottom at a depth of 2043 ft.

### C.C.M.O. Drills On Bandini Well

In the Bandini district east of Los Angeles, C.C.M.O. Co. is drilling Bandini No. 1 on sec. 21-2s-12w at 2050 ft.

Richfield Oil Corp. is ready to start rigging Simons No. 1 on sec. 15. Its U. P. Unit No. 1 on sec. 9 is redrilling at 6160 ft. after plugging back to 6090 ft. for a fresh start from an original depth of 8496 ft.

On sec. 23, C. G. Willis' Pansini No. 1 is standing cemented with 7-in. casing set on bottom at 8195 ft.

### Extension Tried At Del Valle Area

Universal Consolidated Oil Co. and T. E. Adams, operating jointly, are drilling Aquirre No. 1 on sec. 13-4n-18w in the Kern sector of the Del Valle field at 1439 ft. in shale. The combination is trying for a westerly extension of the producing sector opened up by The Texas Co. some months ago.

T. E. Adams is president of the Long Beach Harbor Oil Co.

The Texas Co. has carried Kern No. 22-18 at 3355 ft., and has staked location for Kern No. 23-18, some 1633 ft. south and 954 ft. east from the northwest corner of sec. 18.

### Newhall-Potrero Wildcat Gives Up

Following a final test of an interval between 6200 and 6385 ft., which showed a recovery of fresh water with a scum of oil and light indications of gas, Sanborn No. 1 on sec. 6-3n-18w was abandoned by C.C.M.O. Co., as a production failure.

### Eagle Plans Beach Redrills

Eagle Oil & Refining Co. of Santa Fe Springs is planning to redrill two more wells in the Huntington Beach field, exemplified by Wardlow No. 1 and Tide No. 1.

The company's redrill efforts so far in the Beach field have been crowned with success.

### Leffingwell Test Still Swabbing

Standard of California was last reported swabbing mud with a trace of oil and gas in its Lewis Community No. 1 wildcat situated between Coyote Hills and Santa Fe Springs field. The fluid had not been lowered below 5750 ft.

The well, on sec. 11-3s-11w, went to a total depth of 10,635 ft., before plugging back to 10,293 ft. The 7-in. is set at 10,145 ft.

Performance of the wildcat to date cannot be considered less than disappointing. The fact, however, that some oil was recovered on production test would indicate a discovery of some degree, which may call for further exploratory work to definitely confirm or disprove the area as a commercial oil source.

## Chino Hills Try Drilling

Chino Hills Oil Co., Kraemer-Backs No. 3 on sec. 33-2s-8w in the Chino Hills district of San Bernardino County continues to drill steadily ahead at 1334 ft., without reported showings of oil or gas.

## Shell Drilling Basin Projects

Approximately 4000 ft. east of the present production limits of the Dominguez field, Shell Oil Co., Inc., is drilling Dominguez Estate No. 1 on sec. 2-4s-13w at 400 ft. in sand and shale. Shell divides interest in the test with Union Oil Co. and Dominguez Estate Co. Drill site falls on the east plunge of the Dominguez structure.

The company's current Seal Beach try, Bryant Ranch No. 1 on sec. 34-4s-12w is coring sand and shale at 9925 ft.

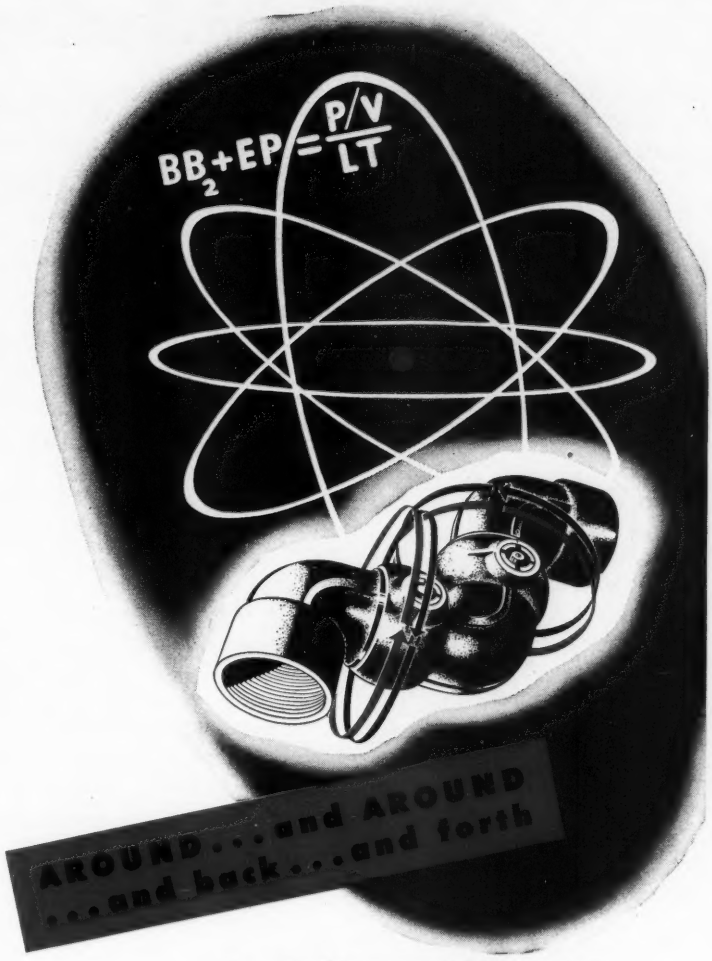
## Coyote Pass Due For Prospect Job

A jointly financed wildcat well is under consideration for the Coyote Pass area, east of Los Angeles, by Dumm Bros. Pet. Corp. and Olympic Refining Co. Tentative site has been selected south of Ramona Blvd., adjacent to the Davidson Brick Company property.

## Carpinteria Test Erecting Derrick

Between Carpinteria and Summerland, Western Gulf Oil Co. has completed foundation and now is erecting derrick for its Peter Cooper Bryce No. 1 wildcat test on sec. 30-4n-25w, Santa Barbara County.

Roads were constructed to drill site across marshlands from Highway 101.


**$BB_2$=Double rows of Ball Bearings**
**EP =Effective Packing Element**
**P/V=Pressure or Vacuum**
**LT =Low Torque under all conditions.**

**Perfect flexibility with low torque is assured in every CHIKSAN *Ball-Bearing* Swivel. Yet Chiksan design and construction are so sound they can be expressed in a simple formula. There is nothing to tighten or adjust... no stuffing boxes to put the brakes on easy turning and thus produce excessive strains on pipe lines and fittings. Smooth, easy turning throughout 360° is provided in one, two and three planes. Packing Element is so effective the same Swivel may be used for either pressure or vacuum service...for loading or unloading. Chiksan *Ball-Bearing* Swivels are built for pressures to 3,000 p.s.i. and varying temperatures. Write for latest catalog.**

**Chiksan Representatives in Principal Cities**

CHIKSAN
TRADE MARK REG.
BALL BEARING SWIVEL JOINTS FOR ALL PURPOSES
CHIKSAN COMPANY
BREA, CALIFORNIA

# Coastal and Northern District

## Way Paved For New Solano Test

Southeast of Vacaville in Solano County, LeBow & McNee Oil Co. has staked location for Peters No. 1, a wildcat gas test, 2590 ft. north and 2700 ft. east from the southwest corner of sec. 7-5n-1e.

The company has approximately 5000 acres under lease surrounding the drill site, which is 7 miles south of gas production at Kirby Hills and 10 miles southeast of the Rio Vista field.

## Capitan Wildcat Coring at 2050 Ft.

West of the Capitan field in Santa Barbara County, Hamilton and Sherman are coring Rutherford No. 1 on sec. 1-4n-31w at 2050 ft., with beds correlating accurately. The ditch has been showing oil and gas.

## Alameda County Test Drilling

N. T. Bradford & J. F. Guardino have spudded their B. & G. No. 1 prospect job on sec. 7-3s-3e in the Livermore area of Alameda County, and now are drilling below 500 feet.

## Rio Vista Project Making Hole Ahead

Peter Cook, Jr., Peter Cook Unit No. 1 on sec. 21-5n-3e in the Rio Vista area, Solano County, continues to make hole steadily ahead at 3500 ft.

## Los Olives Try May Acidize

Hub Oil Co.'s La Laguna No. 1 test, which has been pumping all water on test, may acidize in an effort to develop production. Location falls on sec. 7-7n-30w in the Los Olivos area of Santa Barbara County.

Total depth is 5852 ft. with 7-in. at 4622 ft.

## Wildcat at Conejo Resumes Operations

Sulphur Springs Oil Co., Janss No. 1 on sec. 33-2n-19w in the Conejo area of Ventura County, which has been standing idle for two years at a depth of 4790 feet, is being prepared for deepening to at least 6000 ft., for a look at production possibilities in the lower formations.

## Standard Drops Fillmore Venture

Standard Oil Co., Elkins No. 1 on sec. 6-3n-19w has been plugged and abandoned at a total depth of 13,331 ft.

On sec. 27-4n-19w, E. H. A. Edwards has made location for well No. 1. Firestone Oil Co., O'Leary No. 1 on sec. 29 is idle at 412 ft., awaiting water.

## Long Canyon Try Swabs Little Oil

In the Long Canyon area near Moorpark, Shell Oil Co., Inc., is moving our contractor's rig from McBean No. 1 on sec. 33-3n-20w, after swabbing a little heavy oil and water.

## Tapo Canyon Rig Building

Wilshire Oil Co. is building rig for its N. L. & F. No. 1 on sec. 2-3n-18w in the Tapo Canyon area of Ventura County, which is strictly wildcat country.

## Ventura Avenue Adds Producer

Tide Water Associated Oil Co. has completed Hartman No. 41 in the Ventura Avenue field, flowing at the rate of 1829 barrels of net oil a day from a total depth of 11,546 ft. Gas output was rated at 1928 MCF. Lloyd No. 145 is rigging up.

Lloyd Corp., L. C. No. 16 has foundation in and L. C. No. 18 has reached a depth of 6050 ft.

## Snowball Anticline Test Rigs New Outfit

M. T. Grubb, Operator, Snowball No. 1 on the Snowball anticline, is rigging new equipment to gun-perforate 7-in. casing set at 5292 ft. and test interval between 5150 and 5200 ft.

Located at the north end of Carpinteria Valley, the wildcat is near the Santa Barbara-Ventura County line in Ventura County.

## Padre Canyon Schedules Three

Three new drilling jobs have been mapped out for drilling in the Padre Canyon field by C.C.M.O. Co., on its Hobson lease. They are No. A-16, No. A-20 and No. A-21. Oak Grove No. 5 last was reported pumping all water from total depth of 7800 ft.

On its Grubb lease, Continental Oil Co. is drilling No. A-1 at 7300 ft.

## Los Alamos Job Moving Ahead

Whittier Associates, Glenn Buell No. 3 on sec. 15-7n-32w in the Los Alamos sector of Santa Barbara County continues to drill steadily ahead at 2775 ft. in hard brown shale. Water shut off on the 8⅝-in. casing set at 2403 ft. was OK.

## Cat Canyon Field Continues Active

Union Oil Co. has six drilling jobs at various stages in the Cat Canyon field.

Bell No. 24 on sec. 35-9n-33w is a foundation, Bell No. 27 on sec. 36 is drilling at 3020 ft. No. 40 on sec. 27 is drilling at 4950 ft. Rig has been built for Bell No. 29 and No. 31 is grading ground. On sec. 20, heavier equipment is being moved in for McNee No. 4, bottomed at 8080 ft.

Palos Verdes Estates, Inc., No. 2 is preparing to drill on sec. 27-9n-33w.

## South Mtn. Project Standing Suspended

Los Nietos Co. and Lucy Smith Battson, C. & H. No. 1 on sec. 22-3n-21w at South Mountain is standing idle, after redrilling to 5130 ft. Original hole went to 6315 ft.

## Round Mountain Location Staked

Miller, York & Claire have staked location for K.C.L. No. 1, 220 ft. south and a like distance east from the west quarter corner of sec. 13-28s-28e, Round Mountain.

# San Joaquin Valley

## Edison Prospect Will Go To Basement

In the Edison area, which has been the scene of considerable drilling revival in recent weeks, The Texas Co. has staked location for Hintz No. 1 wildcat test south of the established producing area, 201 ft. north and 201 ft. west of the southeast corner of sec. 23-30-29. It will be a basement test.

## South Dome Try Ends Oil Search

Los Nietos Prod. & Refining Co. has abandoned its South Dome No. 41 wildcat test on sec. 13-25s-19e on the South Dome of Kettleman Hills in Kern County at a total depth of 8550 ft.

Only minor oil and gas showings were logged and the try evidently was running low on structure.

Standard's try on the Middle Dome, No. 73-30V on sec. 30-23s-19e, Kings County continues to drill ahead at a depth of 8650 ft.

## Lost Hills Explorer Milling on Fish

Standard Oil Co., Cahn No. 58-4 deep test on sec. 4-27-21 apparently could not sidetrack and now is milling on fish at 8853 ft.

## Kings County Test Finished

With bottom of the hole in formations of Cretaceous age at 3435 ft., Avenal No. 86-31 on sec. 31-23-17 in the McLure area has been abandoned by British-American Oil Prod. Co. as a production failure. The Kreyenhagen and Eocene were not present.

## Paloma Wells Flow 365 Bbls.

Western Gulf Oil Co. Symons No. 63-7 on sec. 7-32s-27e was completed flowing 365 barrels per day, 53.7 gravity, 0.1 cut through a 20/64-in. bean with 800/700 pounds and 1509 MCF gas.

A southeasterly outpost test, the well was completed at a total depth of 11,719 ft. after topping the Symons sand at 11,524 ft. This is the best Symons producing well so far.

## Cymric Project Coring Ahead

Independent Exploration Co., Oceanic No. 1 on sec. 22-29s-21e in the Cymric area is coring ahead at 4265 ft. after running electric log and dip meter. Cores at present depth are composed largely of oil-stained sand.

Formation test of the interval of 4212-64 ft., open 27 minutes recovered 300 ft. of gassy mud.

## Antelope Hills Well Underway

The Mitchel Co. has staked location for Mitchel Fee No. 1 on sec. 12-28s-19e in the Antelope Hills area of Kern County. Contract for the job has been let to Barns & Shadrick.

## Tejon Well Sidetracks

Tejon Oil Co. is sidetracking in its Tejon No. 1A on sec. 19-11n-19w in the Tejon area, after drill pipe stuck was shot off at 10,100 ft. Spotting of 300 barrels of oil proved ineffectual.

The well is bottomed at 10,328 ft.

## North Belridge Test Scheduled

Belridge Oil Co. has staked location for No. 113A-7 wildcat test, about 1½ miles southeast of the North Belridge field, 1815 ft. south and 200 ft. east from the northwest corner of sec. 7-28s-21e.

## Mountain View Test A Failure

Efforts of Richfield Oil Corp. to develop production west of the Mountain View field in Kern County evidently were unavailing. The explorer, No. 53-16 on sec. 16-30s-28e went to a bottom at 6210 ft. in carbonaceous silt. The top of the Wharton was placed at 6093 ft. and the silt at 6170 ft.

The well was subsequently abandoned.

## Shell Starts Trico Venture

Shell Oil Co., Inc., is grading ground for its Salyer No. 3-1 gas test on the southeast corner of sec. 30-22s-22e in the Liberty Farms area, approximately 10 miles north of the Trico gas field.

Between 5000 and 6000 acres are held by the company in this sector of Kings county. The well is designed objectively to seek production comparable to that already established in the field proper.

Northwest of the Trico field, Trico Oil & Gas Co. is ready to perforate and inaugurate trials of its Atwell Island Comm. No. 1 on sec. 7-24s-23e for gas. The 5½-in. casing was cemented at 3292 ft. Bottom is 4206 ft.

## Buena Vista Test Planned

Seaboard, Universal Consolidated, Wilshire and Mohawk have joined forces and have staked location for a scheduled deep test on the shore of Buena Vista Lake on sec. 14-32s-25e, Kern County. The operating of the well, known as Swum-BVA, will be done by Seaboard.

Location falls 3½ miles off the southwestern flank of the Paloma field on the southeast plunge of the Buena Vista Hills structure.

The combination of companies has decided to go to 12,000 feet if necessary in a search for the Stevens.

## Fruitvale Job Strikes Basement

General Petroleum Corp., Calloway No. 66-17 on sec. 17-29-27 drilled into basement material at 10,050 ft., ran electric log, and last was reported sidewall sampling. Total depth is 10,052 ft.

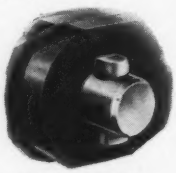
## Casing Cemented In Union Ave. Job

Hancock Oil Co., K.C.L. No. 1 on sec. 6-30s-28e at Union Avenue is standing cemented with 7-in. set at 5339 ft. Total depth is 5343 feet in siltstone.

# Tough CHAIN
## ...FOR EVERY OIL FIELD USE!

Emsco manufactures eight distinct types of oil field chain; the result of years of experience and specialization in the manufacture of chain *solely for oil field use.*

**DESIGNED FOR LONG LIFE**



EMSCO PATENTED LOCKING PIN

A West Coast product, Emsco chain is of highest quality—precision machined from the finest alloy steels, and heat-treated to give maximum service under all conditions. It incorporates the exclusive Emsco patented locking pin and conforms strictly to A P I specifications.

*DALLAS PLANT*
*HOUSTON PLANT*

EMSCO

EMSCO DERRICK & EQUIPMENT COMPANY
Houston, Texas • Los Angeles, Calif. • Dallas, Texas

*Boxed and wrapped in oil and water-proofed paper for Maximum Protection*

NOW AVAILABLE FROM STOCK AT EMSCO LOS ANGELES
...AND ALL PETROLEUM EQUIPMENT COMPANY FIELD STORES

The handiest thing you ever had in field or shop is the Baker Hydraulic Core Extractor and Testing Pump.

*Another Practical & Dependable*

**BAKER Product**

described on Page 374 of the 1944 Baker (or Composite) Catalog



"It's a Wilson"

Casing heads can be supplied for our Type AAX and B Tongs to take from 9⅝" O. D. through 17" O. D. Write for information.

Casing Tong Head for AAX and B

WEB WILSON Oil Tools

W. W. WILSON BUILDING
HUNTINGTON PARK, CALIF.


## Buttonwillow Attracts New Wildcat Operations

Four miles southwest of Buttonwillow, Del Valle Gasoline Co. has staked location for its Bernard No. 1 wildcat test, approximately 1260 ft. south and 2290 ft. west from the center of sec. 5-30s-24e, Kern County.

More than 20 years ago, the Mendocino Oil Syndicate drilled on sec. 6 to 5300 ft., and in so doing logged minor showings of oil and gas. General Petroleum Corp. gave exploratory attention to the general area during 1936 when it drilled Doyle-McKeon No. 1 on sec. 5 to 5070 ft. Customary trials resulted in salt water and little oil.

Principal owners of the Del Valle Gasoline organization are Bob Bering and Russ Havenstrite, developers of the Del Valle area in Los Angeles County.

## Government Restrictions Lifted From Sale of Sisal Rope

Rope starved users will welcome the news that all restrictions governing the sale of Sisal rope have now been lifted. According to an announcement by W. I. Atherton, general sales manager of Tubbs Cordage Company, Sisal rope may now be purchased for every purpose, without priority.

"While our mills in San Francisco and Seattle are still limited as to the amount of Sisal rope, we are permitted to manufacture," Atherton states, "all individual industry quotas and end use restrictions have been withdrawn and we hope that within a very short time we will be able to supply our Victory Brand No. 1 Sisal rope to fill every need."

Present restrictions, however, will continue in full force during the fourth quarter on Manila rope as well as on the use of hard fiber in the manufacture of wrapping twine.

Since Pearl Harbor, the rope industry has been devoting its entire efforts toward supplying the armed forces and the lifting of the restrictions on Sisal rope marks the first step on the road toward normal peace time operation.

**GIVE TO THE WAR CHEST**


WELDERS

**Gas-Electric Nearly New Available NOW**

**Standard makes factory built 300 AMP HOBART skid mounted. Powered with 6 cyl. 53 H.P. Chrysler engine with electric starter.**
**100 ft. welding cord included.**
**Price, f.o.b. L.A.—$675.00.**

**400 AMP G. E. skid mounted with 6 cylinder Chrysler engine with electric starter.**
**100 ft. welding cord included.**
**Price, f.o.b. L. A.—$750.00.**

Will RENT WITH OPTION to buy

Phone — Wire — Write

**BROWN - BEVIS EQUIPMENT CO.**

4900 Santa Fe Ave., Los Angeles 11, Calif.
Phone JE-5221



General Drilling Co.

CONTRACTORS
SUPERVISION

"Remember, it's the last cost that counts, not the first."

Suite 1215
453 So. Spring St.
Los Angeles, Calif.

Telephone: MIchigan 6316



SMITH - EMERY CO.
Since 1904
Oils Tested
Shipments Certified
Tanks Strapped
Offices and Laboratories
920 Santee St. Los Angeles
651 Howard St. San Francisco

# California Oil World's Monthly Summary

## DEVELOPMENT—PRODUCTION—SUPPLY & DEMAND
## PACIFIC COAST TERRITORY
## TABLE I—CALIFORNIA DEVELOPMENT—PRODUCTION

| | AUGUST, 1945 DEVELOPMENT | | | | PRODUCTION | |
|---|---|---|---|---|---|---|
| | Active Drilling Wells | Oil Wells Completed | Initial Production B/D | Oil Wells Completed First 8 Months | Daily Average August 1945 | Daily Average August 1944 |
| **SAN JOAQUIN VALLEY** | | | | | | |
| Ant Hill | 2 | 1 | 26 | 10 | 591 | 66 |
| Antelope Hills | 1 | ..... | ..... | 3 | 1,767 | 1,827 |
| Antelope Plains | ..... | ..... | ..... | ..... | 46 | 43 |
| Arvin | ..... | ..... | ..... | ..... | 51 | 38 |
| Bellevue | ..... | ..... | ..... | ..... | 591 | 711 |
| Belridge—North | 5 | ..... | ..... | 3 | 6,237 | 6,979 |
| Belridge—South | ..... | 3 | 83 | 94 | 13,159 | 10,782 |
| Blackwell's Corner | ..... | 2 | 56 | 6 | 173 | 169 |
| Buena Vista Hills | 8 | 11 | 2,887 | 125 | 49,217 | 17,448 |
| Burrel | ..... | ..... | ..... | ..... | 27 | 25 |
| Canal | ..... | ..... | ..... | ..... | 3,575 | 3,605 |
| Canfield-Gosford | ..... | ..... | ..... | 1 | 225 | ..... |
| Canfield Ranch | ..... | ..... | ..... | ..... | 38 | 36 |
| Coalinga—East | 5 | 6 | 749 | 33 | 22,316 | 22,137 |
| Coalinga—Nose | 1 | ..... | ..... | 1 | 57,155 | 71,253 |
| Coalinga—West | 2 | ..... | ..... | 15 | 7,739 | 7,613 |
| Coles Levee—North | 1 | 2 | 638 | 7 | 15,773 | 18,316 |
| Coles Levee—South | 2 | 1 | 502 | 6 | 2,922 | |
| Edison | 8 | 1 | 220 | 23 | 5,795 | 2,674 |
| Elk Hills | 7 | 13 | 2,494 | 204 | 45,361 | 17,630 |
| Fruitvale | 1 | ..... | ..... | 8 | 8,491 | 9,182 |
| Greeley | 3 | 2 | 1,451 | 8 | 16,132 | 14,043 |
| Helm | 4 | 4 | 451 | 14 | 3,521 | 1,400 |
| Jacalitos | 1 | ..... | ..... | 22 | 3,962 | 776 |
| Kern Front | 3 | 6 | 290 | 27 | 12,518 | 14,121 |
| Kern River | 1 | ..... | ..... | 23 | 9,967 | 9,899 |
| Kettleman North Dome | 6 | 1 | 92 | 13 | 40,467 | 40,338 |
| Lanare | 2 | 2 | 520 | 5 | 533 | 160 |
| Lost Hills | 1 | ..... | ..... | 6 | 3,260 | 3,395 |
| McClung | ..... | ..... | ..... | ..... | 32 | 120 |
| McKittrick | 5 | 6 | 1,082 | 16 | 5,747 | 5,209 |
| Midway-Sunset | 5 | 6 | 255 | 40 | 39,387 | 41,518 |
| Mountain View | ..... | 1 | 201 | 2 | 2,727 | 3,234 |
| Mount Poso | ..... | 2 | 92 | 20 | 18,087 | 21,363 |
| Paloma | 7 | 1 | 540 | 10 | 2,755 | 4,637 |
| Pleasant Valley | 1 | ..... | ..... | 4 | 3,742 | 3,166 |
| Pyramid Hills | ..... | ..... | ..... | 8 | 357 | 174 |
| Race Track | 2 | 1 | 348 | 6 | 976 | ..... |
| Raisin City | 1 | ..... | ..... | 6 | 3,242 | 2,875 |
| Rio Bravo | ..... | ..... | ..... | ..... | 16,837 | 16,053 |
| Riverdale | ..... | 1 | 198 | 7 | 4,128 | 4,779 |
| Rosedale Ranch | 1 | 1 | 89 | 1 | 121 | ..... |
| Round Moutain | 4 | 4 | 352 | 20 | 9,600 | 10,387 |
| Santiago | 1 | 1 | 919 | 1 | 503 | ..... |
| Sheep Springs | ..... | 1 | 365 | 3 | 636 | ..... |
| Strand—East | ..... | ..... | ..... | 1 | 678 | 539 |
| Strand—West | ..... | ..... | ..... | ..... | 1,449 | 1,702 |
| Tejon | 1 | 1 | 106 | 10 | 480 | 163 |
| Ten Section | ..... | ..... | ..... | ..... | 12,164 | 12,157 |
| Union Avenue | 1 | ..... | ..... | ..... | 122 | 98 |
| Wasco | ..... | ..... | ..... | ..... | 1,198 | 1,796 |
| Wheeler Ridge | ..... | ..... | ..... | ..... | 233 | 246 |
| Miscellaneous | 2 | ..... | ..... | ..... | 18 | 40 |
| TOTAL SAN JOAQUIN VALLEY | 95 | 81 | 15,006 | 812 | 456,828 | 404,922 |
| **COASTAL AREA** | | | | | | |
| Aliso Canyon | 2 | 1 | 1,504 | 5 | 3,232 | 3,162 |
| Bradley Canyon | ..... | ..... | ..... | ..... | 36 | 19 |
| Capitan | 2 | 1 | 521 | 3 | 2,653 | 2,768 |
| Del Valle | 1 | 1 | 998 | 2 | 2,528 | 1,951 |
| Elwood | 1 | ..... | ..... | 4 | 5,902 | 6,066 |
| Gato Ridge | 1 | ..... | ..... | 6 | 4,495 | 5,448 |
| Newhall-Potrero | ..... | 1 | 132 | 5 | 5,747 | 5,059 |
| Oak Canyon | 2 | ..... | ..... | 4 | 2,279 | 1,167 |
| Oxnard | 1 | ..... | ..... | 1 | 1,099 | 401 |
| Padre Canyon | 2 | ..... | ..... | 2 | 2,044 | 1,170 |
| Ramona | 3 | 1 | 320 | 3 | 269 | ..... |
| Rincon | 4 | 1 | 49 | 10 | 4,471 | 4,138 |
| San Martinez | 2 | 1 | 362 | 5 | 3,689 | 2,441 |
| San Miguelito | 2 | ..... | ..... | 3 | 5,251 | 5,806 |

| MONTHLY SUMMARY—Continued | AUGUST, 1945 DEVELOPMENT | | | | PRODUCTION | |
|---|---|---|---|---|---|---|
| | Active Drilling Wells | Oil Wells Completed | Initial Production B/D | Oil Wells Completed First 8 Months | Daily Average August 1945 | Daily Average August 1944 |
| Santa Barbara | ..... | ..... | ..... | ..... | 142 | 98 |
| Santa Maria | 2 | 1 | 101 | 6 | 14,467 | 13,667 |
| Santa Maria Valley | 11 | 5 | 487 | 56 | 38,872 | 33,853 |
| Summerland | ..... | ..... | ..... | ..... | ..... | 6 |
| Ventura Avenue | 10 | 4 | 1,309 | 34 | 52,315 | 49,154 |
| Ventura-Newhall | 15 | 2 | 175 | 31 | 6,099 | 6,291 |
| Watsonville | ..... | ..... | ..... | ..... | 25 | 25 |
| Zaca Creek** | ..... | ..... | ..... | ..... | 271 | ..... |
| TOTAL COASTAL BASIN | 61 | 19 | 5,958 | 180 | 155,886 | 142,690 |
| LOS ANGELES BASIN | | | | | | |
| Brea-Olinda | ..... | ..... | ..... | 1 | 11,512 | 11,762 |
| Buena Park | ..... | ..... | ..... | ..... | 99 | 77 |
| Coyote—East | 1 | 1 | 106 | 5 | 4,928 | 5,464 |
| Coyote—West | 4 | 2 | 886 | 15 | 15,564 | 12,092 |
| Dominguez | 2 | 2 | 349 | 7 | 18,591 | 21,110 |
| El Segundo | ..... | ..... | ..... | ..... | 813 | 1,025 |
| Huntington Beach | 4 | 6 | 905 | 38 | 47,686 | 47,728 |
| Inglewood | ..... | ..... | ..... | 1 | 15,032 | 16,959 |
| Lawndale | ..... | ..... | ..... | ..... | 29 | 32 |
| Long Beach | 1 | 1 | 46 | 1 | 26,440 | 29,524 |
| Los Angeles-Salt Lake | ..... | ..... | ..... | ..... | 521 | 459 |
| Montebello | 1 | 1 | 126 | 5 | 9,715 | 10,461 |
| Newport-Costa Mesa | 9 | 11 | 1,350 | 24 | 1,290 | ..... |
| Playa Del Rey | ..... | ..... | ..... | ..... | 2,537 | 2,595 |
| Potrero | ..... | ..... | ..... | 1 | 1,066 | 1,114 |
| Richfield | 2 | 2 | 136 | 9 | 7,653 | 7,081 |
| Rosecrans | ..... | ..... | ..... | 6 | 5,727 | 5,781 |
| Sansinena | 1 | ..... | ..... | 1 | 44 | ..... |
| Santa Fe Springs | ..... | 1 | 53 | 1 | 17,074 | 18,548 |
| Seal Beach | 3 | ..... | ..... | 12 | 10,118 | 7,393 |
| Torrance | 1 | 2 | 56 | 35 | 9,137 | 8,803 |
| Turnbull Canyon | ..... | ..... | ..... | ..... | 178 | 208 |
| Whittier | ..... | ..... | ..... | 3 | 995 | 1,046 |
| Wilmington | 14 | 12 | 1,616 | 90 | 99,864 | 100,985 |
| Yorba Linda | ..... | ..... | ..... | ..... | 551 | 791 |
| TOTAL LOS ANGELES BASIN | 43 | 41 | 5,629 | 255 | 307,164 | 311,218 |
| EXPLORATORY | | | | | | |
| Outpost Wells | 20 | ..... | ..... | ..... | ..... | ..... |
| Wildcats | 28 | ..... | ..... | ..... | ..... | ..... |
| Gas Wells | 4 | 7 | ..... | 39 | ..... | ..... |
| TOTAL CALIFORNIA | 251 | 148 | 26,593 | 1,558* | 919,878 | 858,830 |

*—Includes gas wells completed and 272 wells abandoned.
**—Formerly included with Santa Maria.
Data from A. P. I.

## TABLE II—SUPPLY AND DEMAND FOR PETROLEUM PRODUCTS
## PACIFIC COAST TERRITORY
## DATA FOR AUGUST OF EACH YEAR

| | August 1940 | August 1941 | August 1942 | August 1943 | August 1944 | August 1945 |
|---|---|---|---|---|---|---|
| RAW MATERIAL—B/D | | | | | | |
| 1. Crude Oil Produced—California | 621,194 | 642,308 | 725,158 | 779,059 | 858,830 | 919,878 |
| 2. Crude Oil from outside 5 Western States | 1,226 | 2,014 | 4,745 | 4,554 | 4,428 | 39,348 |
| 3. Natural Gasoline Produced | 39,000 | 38,000 | 37,000 | 40,000 | 43,000 | 45,000 |
| SUPPLY OF FINISHED PRODUCTS | | | | | | |
| ALL SOURCES—B/D | | | | | | |
| 4. Natural Gas., L.P.G. & Condensate | 13,710 | 6,710 | 6,419 | 6,806 | 10,194 | 9,935 |
| 5. Gasoline and Naphtha Distillates | 213,290 | 255,613 | 250,129 | 266,387 | 321,129 | 370,387 |
| 6. Kerosene and Kerosene Distillates | 12,000 | 1,645 | 5,774 | 7,774 | (4,516) | 7,548 |
| 7. Lubricating Oils, etc | 5,226 | 18,548 | 11,387 | 15,290 | 15,935 | 13,290 |
| 8. Gas Oil and Diesel Oil | 73,549 | 76,226 | 67,419 | 86,484 | 108,613 | 93,000 |
| 9. Fuel Oil Residuum | 248,968 | 276,645 | 332,000 | 401,839 | 375,258 | 487,419 |
| 10. Asphalt and Road Oils | 32,129 | 36,097 | 48,581 | 31,451 | 37,613 | 26,581 |
| 11. Coke and Other Finished Products | 1,935 | 2,806 | 1,645 | 968 | 2,485 | 5,257 |
| 12. Other Unfinished Oils | 64 | (1,548) | (2,355) | (2,968) | 2,742 | (2,000) |
| **13. Refinery Shortage and Gas** | **23,226** | **27,290** | **31,259** | **36,807** | **44,804** | **48,323** |
| **14. Crude Oil (Net)** | **42,807** | **(7,774)** | **24,838** | **(9,387)** | **33,484** | **(17,581)** |
| 15. TOTAL SUPPLY | 666,904 | 692,258 | 777,096 | 841,451 | 947,741 | 1,042,159 |
| 16. TOTAL DEMAND | 715,291 | 723,711 | 786,775 | 982,516 | 883,322 | 1,010,613 |
| 17. DIFFERENCE | (48,387) | (31,453) | (9,679) | (141,065) | 64,419 | 31,546 |
| 18. Stocks on hand | | | | | | |
| End of each month (Total Bbls.) | 156,696,000 | 142,986,000 | 131,040,000 | 118,977,000 | 91,041,000 | 76,965,000 |

Data from U. S. Bureau of Mines.

## Carrington King

*(Continued from page 51)*

has not yet been revealed but it is expected Atty. Gen. Kenny will elaborate on his theory Ickes is being buffaloed by what the Californian described as a "group of bunco artists (who) would be willing to sell the bed of the Great Salt Lake right now, if they could."

Kenny contends the real opposition to the legislation is being put up by promoters who file applications with the Interior Department for permits to drill in the tidelands. The gullible public is sold on the idea it is only a matter of time before Federal title to the property can be perfected and that the lands now leased from the State will then be turned over to them for oil operations. The Californian was quoted as telling a group of Western Attorneys General, on Sept. 24, that:

"Tens of thousands of dollars are collected every month to support this racket, and the Department of the Interior is the unwitting front man for these people."

## Annual Fall Meeting Pacific Section American Association of Petroleum Geologists

The Pacific Section of the American Association of Petroleum Geologists will hold its twenty-second annual Fall meeting on Thursday and Friday, November 8 and 9, at the Ambassador Hotel in Los Angeles.

As in the past the geologists and members of the oil industry will gather to hear talks and discussions on a wide variety of subjects of importance to the geologist in the search for oil. In addition to geological talks on areas within the United States as well as foreign countries, there will also be discussions on topics of considerable interest to all members of the oil industry.

Some highlights of the two-day program include a talk by Dr. Chester R. Longwell, Professor of Geology at Yale University and American Association of Petroleum Geologists Distinguished Lecturer, who will speak on "Stratigraphic and Structural Problems of Southern Nevada and Western Arizona," and Dr. Bailey Willis, Professor Emeritus of Geology, Stanford University and also an American Association of Petroleum Geologists Distinguished Lecturer. Dr. Willis will speak on "Terrestrial Dynamics."

A talk by Mortimer Kline, Los Angeles attorney, entitled "The Most Powerful Man in the World," is expected to draw a large attendance of friends of the oil industry.

Friday afternoon the members will hear Claude Leach of Tide Water Associated Oil Co. speak on landslides of the Ventura Avenue oil field and a talk on the use of geology by the military forces in the Southwestern Pacific area by William Putnam of the University of California at Los Angeles.

Mortimer Kline, Los Angeles attorney, will bring the meeting to a conclusion with his talk entitled "The Most Powerful Man in the World."

For the first time, the annual event this year will be preceded by a meeting of an affiliated group of the Association, the Pacific Coast District of the Society of Exploration Geophysicists. The geophysicists will hold their meeting on Wednesday, November 7, the day before the opening of the regular session. Included on the program for Wednesday afternoon at the geophysicists' meeting, Howard C. Pyle, formerly Lt. Colonel U. S. Army and deputy chief of the oil supply branch in Europe, will tell of the petroleum supply to the U. S. forces in Europe and A. C. Rubel of the Union Oil Co. will discuss some political and economic aspects of a foreign exploration program.

As a finishing touch to the annual meeting, a dinner dance will be held in the Embassy Room of the Ambassador Hotel on Friday evening, for all members and friends of the Association and its affiliated groups.


**DOUBLE PLAY!**

**Many emulsions are stabilized by the presence of wax particles.**

**NOBS new combination chemical dehydrates oil and re-suspends wax in one operation, reducing cost of production.**

**NOBS DEHYDRATING CORPORATION**

**2465 East 53rd St.**
**Los Angeles 11, Calif.**
**Kimball 9288**

**GEOLOGICAL ASSISTANT**

**Large Oil Company requires services of experienced man in home office in East. Salary to fit the man. Write full particulars, education, experience, references. Reply to B-53, P.O. Box 3495, Philadelphia 22, Pa.**

**WELL GEOLOGISTS**

**To watch progress of wells in Eastern Venezuela. Care for samples, picks, casing points, core points, etc. Write**

**THE ATLANTIC REFINING CO.**
**(Rm. 900) P.O. Box 7258, Philadelphia 1, Pa.**

**FIELD GEOLOGIST**

**Exploration work in Venezuela. Should have 3 years experience in mapping Rocky Mountains, California or Foreign. Write to**

**THE ATLANTIC REFINING CO.**
**(Rm. 900) P.O. Box 7258, Philadelphia 1, Pa.**

**GEOLOGIST-SUBSURFACE**

**For Venezuela, five years experience, preferably foreign.**

**THE ATLANTIC REFINING CO.**
**(Rm. 900) P.O. Box 7258, Philadelphia 1, Pa.**

**GEOPHYSICIST**

**To act as field supervisor of contract parties. Eastern Venezuela. Write to**

**THE ATLANTIC REFINING CO.**
**(Rm. 900) P.O. Box 7258, Philadelphia 1, Pa.**